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THE SOUTH AFRICAN EXHIBITION.

THE SOUTH AFRICAN EXHIBITION, PORT ELIZABETH, 1885;

LECTURES, PRIZE AND OTHER ESSAYS, JURY REPORTS AND AWARDS.

Published by Authority of the Executive Committee of the Exhibition.

EDITED BY

CHARLES COWEN, F.S.S., &c.

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PREFACE.

When the Exhibition of Arts, Manufactures and Products of South Africa was about to close in January last, a desire was expressed to retain, in convenient form, a record of the proceedings connected with that Industrial display. It was therefore resolved by the Executive Committee to collect the Lectures, delivered in the Town Hall during the Exhibition, the Essays to which prizes were awarded, and other matters of general interest, and publish them as a useful memorial of so memorable an occasion. Two members of the Committee, Messrs. Joseph Walker M.L.A., and W. Hume, were requested to make all arrangements for this publication.

Steps were immediately taken by these gentlemen with that object. To Mr. Charles Cowen was entrusted the editorial part of the work, and the results are now before the reader. In no case has the text been interfered with to affect an author's views: each writer is alone responsible for the opinions which he has expressed.

With two exceptions the proofs have been revised and corrected by the contributors. At his request, and in his absence from the Colony, Mr. Stewart's (XII.) passed through the hands of the Colonial Hydraulic Engineer, Mr. Gamble; and Professor MacOwan obligingly revised No. VIII., as it was not in type when death unfortunately deprived us of Mr. Golding, the first practical writer on the subject of our Fruits and Fruit Trees.

In the place of an admirable *viva voce* Address by Dr. Berry, of Queen's Town, relating to Scab in Sheep, of which unfortunately a transcript could not be obtained, it was deemed expedient to substitute the Essay on Scab in Sheep, by Mr. J. W. George, of Graham's Town, as amended and revised by the Joint Committee of the

Chamber of Commerce and the Agricultural Society, to which they had awarded the prize of £10.

To make the volume of yet more practical utility, especially to Stock-breeders, Mr. W. G. RATTRAY has kindly furnished No. XIX., although the subject of Horse-breeding, as a speciality, was not included in the Exhibition syllabus. This essay was submitted to Colonel CURTIS, Deputy Adjutant-General, and Messrs. H. B. CHRISTIAN, HILTON BARBER and MATTHEW BLAKE, who approved generally of the essay, and of the suggestions made by the author. The thanks of the Committee are due to these gentlemen, and to others who acted as Judges of the Competitive Essays sent in. Among these may be mentioned Professor FISCHER, of Stellenbosch; Mr. D. HUTCHEON, Colonial Veterinary Surgeon; Messrs. J. B. HELLIER, P. W. COURT, CHARLES LEE, A. WILMOT, R. HALLACK, W. SAVAGE, JOS. WALKER and W. HUME; also to Mr. JOHN NOBLE, Clerk of the House of Assembly, for ready and valuable assistance rendered in connection with the publication.

The Table of Contents is arranged as an analysis of each Lecture and Essay, and presents at a glance a précis, which will both facilitate perusal and make clear to the casual reader the substance of what is in the book.

The great distance of authors, editor and printers from one another has unavoidably caused inconvenience, and grave delay with the latter. Through some of these difficulties that perfection may not have been secured which could be desired in such a publication as the one now in the hands of the reader.

INTRODUCTION.

The memorial of such an event as the holding of a great South African Exhibition at Port Elizabeth would be far from complete without other information being included than such as the reader will find in the Essay descriptive of some of the incidents connected with that Exhibition and its contents.

That information cannot be more succinctly supplied than by the few records which give, in a summary form, a narrative of the preliminary steps that were taken for the formation of the Exhibition, the arrangements to carry it out, and some of the results of that Exposition, as set forth in the following transcripts.

At a general meeting of the Guarantors, held in Trinity Church School-room on Tuesday evening, the 6th April last—the Honourable H. W. Pearson, Esq., M.L.A., presiding—Mr. Frederick Levick, the Secretary, read the

REPORT OF THE EXECUTIVE COMMITTEE TO THE GENERAL COMMITTEE OF THE SOUTH AFRICAN EXHIBITION.

Before entering upon the details of their proceedings, it may be well for the Executive Committee to state that the intention to hold a Grand Industrial Exhibition of Arts, Manufactures and Products of India and the Colonies in London this year, made it desirable that some well-organized effort should be put forth in order that the Colonies of South Africa should be adequately represented at that Exhibition, and, chiefly to promote this object, it was suggested that an Exhibition should be held in Port Elizabeth, from which a selection could be made for transmission to London.

A public meeting was therefore called by the Promoters on the 31st October, 1884, when a General Committee was appointed, and it was decided to request the Mayor and Town Council to allow the New Market Buildings to be used. With ready generosity, not only the New Market Buildings, but the adjoining Produce Market, were placed at the disposal of the Committee, free of all charge.

As the most important preliminary, it was decided to open a Guarantee List. This was liberally subscribed to in Port Elizabeth, and also by residents of London interested in the Cape trade. A certain proportion of the guarantee was advanced in cash, and your Committee have fortunately been able to repay every penny of this advance.

At a subsequent meeting an Executive Committee was appointed, consisting of :—H. W. Pearson, Esq. (Mayor), Chairman ; C. T. Jones, Esq., M.L.A., J. Walker, Esq., M.L.A., Hon. John Tudhope, M.L.A., W. Hume, Esq., W. Savage, Esq., A. Wilmot, Esq., E. Castens, Esq., and J. Brister, Esq.

Mr. H. B. Christian was afterwards added in place of the Hon. Mr.

Tudhope; and Mr. Ryall, a member of the London Sub-Committee, was also put on the Executive Committee, on taking up his residence here. These gentlemen at once took action, and being liberally assisted by the Colonial Government, entered on the necessary arrangements, and appointed various Sub-Committees.

The result was that the Exhibition was opened on the 10th December, 1885, by His Excellency Sir Hercules Robinson, G.C.M.G., P.C., &c., &c., the Governor of the Colony, who, accompanied by Miss Robinson, had visited Port Elizabeth for the purpose of the ceremony.

The attendance on this occasion included Lieutenant-General Torrens and Staff, Admiral Sir W. Hunt-Grubbe, the Hon. Thos. Upington (Premier of the Colony), the Captain and Officers of H.M.S. *Raleigh*, and a large concourse of visitors and residents.

The address from the Committee was read by the Chairman, and replied to by His Excellency.

The Exhibition continued open until the 9th of January, 1886, when it was formally closed.

Musical entertainments were provided all through the Exhibition. The band of H.M.S. *Raleigh* gave a few performances during the first week, and the band of Prince Alfred's Guard performed from time to time throughout the Exhibition. From the 20th December to the 2nd January, the splendid band of the Inniskilling Dragoons drew large audiences from day to day to listen to their performances. A choir of ladies and gentlemen, under the able conductorship of Herr Eberlein, of Graham's Town, gave several Ballad and Miscellaneous Concerts and Oratorios, which, from the opening performance of the Messiah on the first night, to the Miscellaneous Concert on the last night of the Exhibition, were received with great enthusiasm by the audiences.

During the period referred to, the receipts amounted to :—

From the Government...	£500	0	0
For space let	803	17	0
Por admission	3,287	12	6
Other receipts	334	7	9
	£4,925	17	3

and the expenditure to £4,884 16s. 11d., leaving an approximate balance of £41 0s. 4d.

The accounts are submitted with this report. The various reports of Judges are also annexed, from which it will be seen that the Exhibition was greatly assisted, not only by the colonists generally, but especially by the Committee acting for the Diamond Fields, and the sister Colony, Natal.

Some difficulty and delay has arisen from the desire of the Committee to obtain the most capable and reliable Judges. Time was often lost, and much inconvenience caused by the inability of some to attend at certain times; but in the end the Committee have great confidence in the result, and have been able to avoid any suspicion whatever that undue influences affected the decisions.

It was impossible to please all contributors, many of whom were worthy of more or less recognition, even beyond the large number, who, according to the needful rules, obtained awards.

The medals and certificates will cost about £450, which amount will be defrayed out of the vote of Parliament for that purpose, and they will be issued as soon as received from England, probably in June next.

The response of the public to the wishes of your Committee greatly exceeded expectation.

In some respects a better show might have been made, especially in cereals and Western districts' products.

It was hoped, also, that the Transvaal, the Free State, and outlying country would have been more distinctly represented. At a future Exhibition that may be the case, and the Committee recommend that it will be highly desirable, when another opportunity may arise, for every portion of South Africa, and every town, village and field-cornetcy in it, to be fully represented in due proportion.

The attendance numbered: Actually passing turnstiles, 49,442; season tickets and free tickets, attendants, &c., 11,000; estimated at, say 60,442 in all.

That this large number of visitors were both pleased and instructed, your Committee is proud to feel confident of, and it was the constant proof of this pleasant result that encouraged your Committee in their daily exertions, and rewarded all concerned for the trouble and time expended in arranging and conducting the enterprise.

By this Exhibition the inhabitants of distant portions of the Colony have not only become better acquainted with the productions of their respective districts, of the manufactures that have been or can be established, of the essential importance and future independence of the country they reside in, but have become—and this is perhaps of the greatest value—better known and better estimated, the one by the other.

In rendering up their trust to you, the Executive feel that they have done all in their power to carry out your desire. They acknowledge many omissions, as they learned by daily experience of what might or should have been done, had matters been otherwise designed at the commencement of operations; but they are able to congratulate you on the appreciation bestowed upon your endeavours to show to the South African world what can be effected by its own citizens for the benefit of the Colony, and of the Empire all are so proud to belong to.

Appended to the report was the following Balance Sheet.—

FINANCIAL STATEMENT.

Revenue.

Government Grant		£500 0 0	
Guarantors—			
Local	£709 5 6		
London	250 0 0		
		959 5 6	
Donations		159 15 0	
Space Fees		803 17 0	
Premiums		96 1 0	
Entrance Money		3,287 12 6	
			£5,806 11 0

Expenditure

Grants—Country Committees	£238 10 0
Insurance	15 15 0
Travelling Expenses	148 4 0
Stationery	36 15 9
Printing and Advertising	602 14 9

Charges		£204 11 10	
Fittings		541 4 2	
Decoration		86 2 1	
Chairs		32 9 0	
Nannucci & Co.		48 11 0	
Catalogues—			
Expenditure ...	£276 13 0		
Receipts	276 11 9		
		0 1 3	
Inniskilling Band		404 4 8	
Electric Light		584 19 3	
Petties Sundries		140 14 4	
P.A. Guard and *Raleigh* Bands ...		112 10 8	
Concerts		291 15 0	
Salaries		485 7 0	
Wages		528 11 8	
Gratuities to Employés		68 4 6	
Guarantors' Refund—			
Local	£709 5 6		
London	334 19 3		
		1,044 4 9	
Amount appropriated for the preparation of a Memorial Volume, descriptive of the Exhibition		150 0 0	
		£5,765 10 8	
Balance ...		41 0 4	
			£5,806 11 0

Assets not yet realized—say £35.

H. W. Pearson, Chairman.
W. Savage, Hon. Treasurer.

On the 10th of December His Excellency the Governor, with Miss Robinson, having taken their places in the Great Hall of the Exhibition, the Hon'ble Mr. Pearson, M.L.A., Mayor of Port Elizabeth, and Chairman of the Exhibition Committee, read to His Excellency the following Address:—

To His Excellency the Right Honourable Sir Hercules George Robert Robinson, Member of Her Majesty's Most Honourable Privy Council, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief of Her Majesty's Colony of the Cape of Good Hope in South Africa, and of the Territories and Dependencies thereof, and Her Majesty's High Commissioner, &c.

The success achieved by the promoters of the Exhibition of Arts and Manufactures in Cape Town induced some gentlemen of this town to propose that an Exhibition should be held in Port Elizabeth during the current year.

The severe drought that had so long afflicted the Colony, and the lamentable depression from which every branch of agriculture and commerce were suffering, naturally caused many persons to predict that the somewhat ambitious attempt would result in a disastrous failure. Stimulated by deep interest in the welfare of the Colony, the

promoters convened a meeting, which, on consideration that the approaching Colonial and Indian Exhibition in London would afford a welcome opportunity for the manifestation in England of the powers of production in this portion of the Empire, determined to proceed with the undertaking, and were speedily and generously encouraged by donations and guarantees against pecuniary responsibilities. A Committee was accordingly formed to promote the desired object.

The effort was cordially supported by those in England who were interested in Colonial trade, and by manufacturers who dealt with the products of this Colony.

The Committee were further encouraged by the liberal offer of the Municipality to allow the Market Buildings to be withheld from their destined use for a while, in order that they might be utilized for the purpose they have been found so well fitted to serve.

Promises were amply made by the leading firms to procure special manufactures of the produce of the Colony, with the view of putting in evidence before the growers of that produce, the advantages of skilful preparation, and the large increase of wealth that would result from careful growth and manipulation of exported articles.

The display of fabrics, manufactured from Cape wools and mohair, will prove of real value to all studious observers both here and in England. Some wools from other countries have been procured for the purposes of educational comparison, and the Committee trust that these exhibits will be duly appreciated by those interested in the subject.

The Committee earnestly hope that especial study will be given to the varieties of wool and its products, so that a speedy advance may ensue in the value of that main staple of the country, which has evidently suffered grievously from the want of that attention so energetically given to it in other Colonies.

The exhibition of ostrich feathers, and of the treasures of the marvellous Diamond Fields, as well as the specimens of gold and other valuable substances, will testify to the worth of this distant possession of the Crown, and create appreciative interest, not only here, but wherever they may be exhibited.

The exhibits fashioned of Colonial woods and other substances will establish facts of the most encouraging character.

From the institutions founded for the training of natives, most interesting results of industry hold out unexpected promises of future prosperity. The sister Colony of Natal has favoured the Committee by forwarding a series of valuable exhibits.

The Fine Art Department affords manifest traces of the development of the more refined tastes that grace civilization, and the existence of varied talents.

The enormous advance made of late years in the application of machinery is amply proven, and certain Colonial-made machines and fittings establish the existence amongst us of very able mechanics and most useful work.

Witnessing the splendid collection gathered within these walls, the Committee feel satisfied that all visitors will be strengthened by new hopes of the Colony, and the Committee rely for their reward on the future manifestation of the stimulating results of their earnest work.

The Committee tender thanks to the Government and Parliament for the financial and other assistance so heartily offered.

The Committee trust, by the help of able judges, to distribute the medals and rewards so that real merit may be duly recognised.

The Committee gratefully thank the numerous exhibitors for the spontaneous manner in which they have taken part in the friendly competition, which, it is hoped, will yield permanent advantage to them all. It only remains for me, on behalf of the town and the Committee, to respectfully thank your Excellency for kindly responding to their invitation to open the Exhibition to the public.

The Committee will, by lectures, essays and other means, endeavour to render the Exhibition as attractive and useful as possible. They are satisfied that in so doing they will receive the sympathy of your Excellency, and will be putting into effect the patriotic intention which prompted His Royal Highness the Prince of Wales to gather within the principal city of the realm, the military resources of the vast possessions, and of the energies and abilities of the widespread people who tender homage and fealty to Her Majesty the Queen.

The Address was then presented to His Excellency, and he replied as follows —

MR. PEARSON, and Gentlemen of the Committee:

It gives me much satisfaction to be present here to-day, and to be entrusted with the pleasing duty of opening this instructive Exhibition of the products and manufactures of South Africa.

The promoters of this Exhibition wisely determined that it would materially aid the adequate representation of South Africa in the Indian and Colonial Exhibition, to be held in London during the coming year, and that it would at the same time afford the inhabitants of South Africa an opportunity of becoming better acquainted with the natural resources and manufacturing capabilities of this country.

I think that all who are present here to-day will be able to congratulate the General Committee on the remarkable success with which they have attained the objects sought by them.

The Exhibition now opened cannot fail to foster a spirit of emulation amongst the inhabitants of South Africa, and I trust that it will not only inspire renewed confidence in our resources, but will encourage a healthy determination to advance the industries of this country to a foremost position amongst those of the dependencies of the Empire.

In many products South Africa has resources of a high order. Our diamonds, mohair and ostrich feathers need fear no competition, whilst with greater attention to the processes of modern science, such articles as wine, tobacco, leather and wood may be advanced to a good position in the markets of the world. In the quality of our wool it will, I fear, be found that we have been left behind by Australia and South America. If this be so, I trust that none amongst us will lose heart, but that the wool farmers who visit this building will leave with a firm determination to restore this important staple industry of the country, to its former prosperous condition.

I am glad to learn that the Committee intend to arrange for conferences on leading subjects connected with the farming interest, at which papers connected with the farming industry will be read, and discussed; and I trust that much profit will be derived from this discussion of practical questions by practical men.

But it is not only in its natural resources that South Africa can make a good display. The samples of manufacturing ingenuity and enterprise contributed by local establishments, show that in many branches of skilled industry South Africa is no longer dependent on other communities.

I cannot conclude without referring to an exhibit, which though not classed in the catalogue, may well encourage a feeling of pride: I refer to the show of vigorous, healthy and intelligent colonists who are here to-day. I trust that many of them will follow the exhibits to London, and show to the people of England that South Africa is not only a source of wealth and a field for commerce, but that the people of this country constitute in themselves a material element in the strength and resources of the Empire.

I now declare the South African Exhibition of 1885 open to the public.

On the 9th January the Exhibition was brought to a close by an Address from the Chairman, as given below :—

LADIES AND GENTLEMEN,—We have arrived now at the closing series of these Exhibitions, but we never could have hoped that we could have wound up with such an attendance as we have to-night. For this success thanks are due to the Entertainment Committee for their unflagging industry, but especially to exhibitors from all parts of the country, who have manifested a desire to help us in this undertaking, and in helping us have shown a desire to help the whole Colony, which has been our wish in this undertaking. The benefits to be derived from this Exhibition are not of to-day or to-morrow, but they are benefits that will be of long standing, and essentially beneficial to the future development and progress of the Colony at large. It is through the results of all classes in this Colony working with one desire—the same desire under which the Executive Committee have worked—all for the benefit of the Colony—that we have seen the immense attendances that day by day have gathered to this building. I am quite sure I may, on your behalf, express thanks to Herr Eberlein and those of the choir who have kindly given their help and assistance for this purpose. Herr Eberlein has manifested a desire to help this little town of ours, and but for him we should not have so many good and able musicians as we have here present to-night. Last Saturday it was, I think, I thanked the Inniskilling Band for their great services, on their departure from among us. To-night I would thank the local Volunteers, who willingly and readily have given their services to us. I have also heartily to express our thanks to the large number of visitors, and hope that the visit will prove of much advantage to them; that it will not be lost time. Port Elizabeth will be always happy to receive and welcome them—though not in this large room and with the electric light—still with a hearty and cordial welcome they will be received by the citizens of Port Elizabeth whenever they may join their services in the interests of our common Colony, which we have all made our home. Ladies and gentlemen, it is now my duty to declare this Exhibition closed, and I am glad to be able to do so in the presence of such a number of people, who will take away pleasing mementoes and expressions of faith in the result of the South African Exhibition.

I.

THE SOUTH AFRICAN EXHIBITION AT PORT ELIZABETH, 1885-6.

ANALYTICAL AND DESCRIPTIVE ESSAY,

BY WALTER BRUCE, *Port Elizabeth.*

EXHIBITIONS AND THEIR FUNCTIONS.

THE different Industrial Exhibitions and Expositions which have taken place during the present generation have served to fully exemplify the expression "Peace hath its victories as well as War." The memorable World's Fair in London, in 1851, was such a marked success that it seemed to point an example to all times and all climes. Since then, in the principal Continental cities, and in America, Australia, at the Cape, and in other parts, Expositions on a similar or a smaller scale have been held, and have served to demonstrate the fact that such gatherings are amongst the requirements of nineteenth century life. Displays of such a nature, with suitable accessories and associations, fulfil one of the wants of the age. They mark the condition of social, industrial, artistic and scientific progress, and furnish opportunities of reunion, recreation, instruction and education in keeping with a rapidly advancing civilization. The Healtheries, the Fisheries and the Inventories have only served to further exhibit how popular is the development of the idea. Probably the present century will witness gatherings compared with which all former ones of the same nature will pale into comparative insignificance.

THE SOUTH AFRICAN EXHIBITION.

In the latter part of 1884, when intimation had been made of the projected Indian and Colonial Exhibition in London this year, it was decided to hold an Exhibition in Port Elizabeth, having amongst others the following principal objects: to assist in the work of representing the Colony at the Home Exhibition, and to afford the inhabitants of

South Africa an opportunity of becoming more intimately acquainted with the natural resources and manufacturing capabilities of their country. The original promoters expressed themselves deeply impressed with the importance of making every effort to show that the inhabitants of these colonies "have determined to take their stand as producers and manufacturers side by side with those of other countries represented in the London Exhibition." The programme, it must be confessed, was a somewhat ambitious one, and at the outset of the movement pessimistic predictions prevailed as to its ultimate success. The Executive Committee, however, seeing their way steadily pursued it in the face of objections and difficulties which would have disturbed the calculations, tried the temper and discouraged and disheartened less determined men. There was liberal response to the appeal for a guarantee fund, and from the important and influential interests throughout the country material assistance and encouragement were obtained. The committee, however, for many months worked earnestly, assiduously and persistently in the face of adverse opinion and discouraging predictions, but were ultimately rewarded, as they deserved, with a full measure of success.

THE OPENING CEREMONIES.

Thursday, the 10th of December, 1885, was the day decided upon for the opening, and by that time it had become evident that this Exhibition would be by far the most important affair of its kind ever inaugurated in South Africa. Similar Expositions have taken place at Cape Town and on a miniature scale in Natal, but all preceding efforts of this nature have been of much more limited dimensions. The fact that the whole of the available space of 24,000 feet had been taken some time prior to the date of opening was sufficient proof that manufacturers and producers were fully satisfied with the objects of the Exhibition.

It had been decided to hold the Exhibition in a group of buildings, the principal of which was a large new Produce Market, just completed for the Port Elizabeth Municipality. Situated in a central position at the south end of Main-street, the buildings proved most suitable; indeed it is doubtful whether anything so generally convenient could have been obtained in any other part of South Africa. The main hall, which throughout the period of the Exhibition was the popular resort, is 150 feet long, 100 feet broad, 72 feet high,

and has over 800 feet of gallery space of an average width of 12½ feet. The other rooms were equally spacious, and proved eminently adapted to the purpose of such an Exhibition. Everything possible for the convenience of visitors and exhibitors received careful consideration, with a result that may be regarded as unusually satisfactory. Decorations had been utilized judiciously enough to render the interior very attractive to the eye. A fountain in the centre of the main hall made a pleasing feature. At one end of the hall an orchestral stand had been constructed, for the accommodation of the large number of musicians and vocalists, who took part in the series of musical performances which formed one of the special features of the Exhibition period. Ventilation and lighting were excellent; and the principal exhibits had everything of the nature of effective display.

Messrs. Heenan & Froude, of Manchester, undertook the evening illumination, and provided electric lights of the most approved kind. At the outset the latter did not prove thoroughly satisfactory, but on the whole fulfilled anticipations, and furnished visitors with an interesting novelty

The opening ceremonial, on the 10th December, had everything connected with it calculated to render it memorable. The day having appropriately been proclaimed a public holiday, was generally observed as such in the town. At noon His Excellency the Governor, who had consented to open the Exhibition, arrived at the building, which contained a large and representative assemblage of visitors. The ceremonies customary on such occasions having been performed, the Mayor of the town (as Chairman of the Executive Committee) read an address reciting the objects and conditions of the Exhibition. The reply of His Excellency was in many respects interesting, and at the conclusion a genuine outburst of applause testified concurrence in the sentiments expressed.

The reading of a well-timed and well-worded telegram from Sir John Brand, the President of the Free State, brought this part of the proceedings to a close.

THE VISITORS TO THE EXHIBITION.

This may be a fitting place to state that, from the opening to the close, on the evening of the 9th January, 1886, interest in the Exhibition never waned in the slightest. The number of visitors is computed at a total of 60,000 (including those

who were admitted free). Throughout the period of the Exhibition there was a continual accession of fresh faces. The visitors were typical and representative of every kind of South African resident, and hailed from all parts of this colony and the principal centres in Natal, the Free State and the Transvaal. One striking feature was the remarkably good feeling and order exhibited. The proceedings even on the most crowded occasions were as orderly and decorous as could well be desired. Natives and Malays were amongst the visitors, and were careful observers of the sights around. The Consuls of different countries took close scrutiny of the exhibits, and no doubt, furnished their respective Governments with valuable reports.

Briefly expressed, one may fairly assume that, as an outcome of this Exhibition effort will be revived and energy strengthened and hope in the future of the colony aroused by the fresh proofs of its capabilities.

ENTERTAINMENTS, LECTURES, ETC.

The provision made for musical performances proved the most successful feature of the Exhibition, and contributed materially to attract visitors. The Band of Prince Alfred's Guard, an excellent one, rendered valuable service throughout the full period of the Exhibition. The Band of H.M.S. *Raleigh*, in port at the opening, also gave performances which were much appreciated. It fell to the lot of the Band of the Inniskilling Dragoons, however, to achieve the greatest triumph. From its arrival from Natal on the 18th of December until its departure on the 4th January this Band obtained and retained the fullest measure of popularity. Its performances in the Exhibition Building evoked the most lively enthusiasm.

In addition to these instrumental performances, miscellaneous concerts by vocalists numbering nearly 150, and inclusive of the best talent of this and adjoining towns, were frequently given, and proved highly attractive. Herr Eberlein, the conductor, and the whole of the vocalists, who rendered cheerful and willing assistance, deserve full recognition for their efforts.

In connection with the Exhibition some really valuable lectures were delivered in the Town Hall, by gentlemen well qualified to deal with questions of vital interest to the whole community. These lectures were of such importance that their publication *in extenso* has been decided on by the Executive Committee.

CLASSIFICATION OF EXHIBITS.

For the purposes in view, it has been considered desirable to adopt the following general classification:—

(1) Animal products and manufactures therefrom, comprising wool, mohair, ostrich feathers, silk, textile manufactures, leather, soap, candles, millinery, &c.

(2) Vegetable products and manufactures therefrom, comprising woods, wines, spirits, ales and vinegar, cereals, tobaccos and cigars, jams and preserved fruits, honey, seeds and bulbs, confectionery, woods used in construction—furniture, carriages, dairy utensils, models, fibres, hammocks, matches, &c.

(3) Minerals and metals and manufactures therefrom, comprising coal, mineralogical specimens, gold, salt, guns, ironwork, tinware, machinery jewellery, windmills, sewing machines, brickwork, stonework, &c.

(4) The Kimberley, Natal and Brazil Courts, native exhibits, curios, &c.

(5) The Fine Arts, books, bookbinding, lace and fancy work, perfumeries, &c.

(6) Miscellaneous exhibits not included in the above classes.

CLASS I.

ANIMAL PRODUCTS AND MANUFACTURES THEREFROM

WOOL.

Wool is one of the most important South African exports, and upon its value in the European market colonial prosperity or adversity closely depends. For a considerable time the value of this staple has steadily declined, until now the prices obtainable are probably the lowest on record since 1868-70. Some of the causes of this depreciation are no doubt clearly ascertainable; others remain in the region of conjecture. For the last half-dozen years the output by the principal wool-producing countries of the world has been unprecedentedly large, while owing to the almost universal depression in the textile industries the demand has been limited. Not until there has been a recovery from this depression—probably one of the results of over-production—and not until there is a genuine revival in woollen manufacturing, can we expect any permanent improvement in the values of Cape wools. Another reason for this

depreciation may be found in the fact that while Australia and South America have been steadily increasing the quantity and quality of their wools, South Africa has been if anything retrograding. As a consequence of this condition of affairs a justifiable feeling of apprehension has arisen that the Cape is being driven out of the market, and in some quarters the opinion seems to prevail that we are far behind other well-known wool-producing countries. The discussions by the different Farmers' and other Associations, and the continual correspondence in the columns of the press during the past twelve months, seem to furnish evidence that a wide-spread feeling of alarm prevails on this subject. This is a perfectly natural outcome, only it is to be feared many people are prone to carry pessimism a step too far. No one can reasonably deny that the great proportion of Cape wool is very far below what it might be, but with so much good wool as most of us have seen in different parts of the country there is sufficient evidence in existence of our capability of competing with any other part of the world. We may just for the present occupy the worst position in the markets of the world, but this can only be for a period. At this Exhibition the samples in grease and fleecewashed from Molteno, Bedford, Cathcart, and other places in this Province furnished conclusive evidence that the colony can produce wool little if at all inferior to the best from other parts of the world. It seems a matter for regret that there were no exhibits of wool from the Western Province, as an opportunity of comparison could not but have been beneficial. At the forthcoming Exhibition in London, however, there is to be a very good representation of Cape wools, including a representative collection from the Western Province; and there seems no reason to fear that the comparison with the produce of other countries will be to our discredit. The bulk of the Cape wool as at present sent to market is, however, capable of great improvement, and very probably the Exhibition has aroused a healthy desire to improve the quality and consequently the value of this staple. Messrs. Savage and Hill, who are referred to elsewhere, performed most valuable service to the whole community by enabling comparison to be made of Cape wools with the best clips from the Australian Colonies and South America. Their efforts in this direction are worthy of the warmest recognition and furnish a valuable example for future Exhibitions. To deal with the wide subject of wool-producing would require a volume, but summarizing the evidence before us it would appear

that in order to improve the quality of South African wool three conditions are essential, viz.:—

(1) Purity of breed.
(2) Freedom from scab.
(3) Annual shearing only.

In regard to the first essential, it seems probable that Australia would furnish rams most suitable and best likely to acclimatize. Rams of good pedigree, shape, size and wool-producing qualities only should be thought of, and the offspring kept carefully unmixed, so as to fully and fairly experiment.

With reference to the much-discussed matter of scab, it is evident some compulsory Act is necessary. From the records of sheep-farming in Australia it would seem that at one period Scab Acts of a stringent nature saved these colonies from ruin. In the adjacent colony of Natal a scab law was passed about nine years ago. For some considerable time an important portion of the sheep farmers regarded the measure with marked disfavour. In the course of time, however, prejudices disappeared, and the enactment (since modified) is looked upon by the majority as a great advantage to the colony.

In connection with the matter of annual shearing only, it is extremely desirable that the packing of the wool should receive much more careful superintendence. It should no longer remain to the discredit of the Cape farmer in Europe that his bales contain so much that is not wool.

The exhibit of wool may be said to be fairly representative of the Eastern Province produce, and was sufficient to furnish the country visitor with a silent lecture. The exhibits showed how some farmers have improved the breed of their sheep, and how capable the latter are of producing clips unsurpassed anywhere. During the period of the Exhibition the wool room was visited by interested groups of spectators, who, no doubt, obtained information and encouragement of a most valuable character. The report of the judges in this department was concise and comprehensive, and is well worthy of careful perusal.

SCOPE FOR A NEW INDUSTRY.

Though only having an indirect bearing on the subject, one may perhaps be permitted to point out that, there is scope for a new industry, in reclaiming the oleaginous substances in the refuse waters at the wool-washeries, now

suffered to run to waste. In Europe this is turned to profitable account, and in some parts of England fortunes have been made from the industry. By mixing sulphuric acid (oil of vitriol) with the refuse water the fatty matter returns to the surface, is skimmed off, and by a comparatively simple process is rendered ready for soap-making and other useful purposes.

MOHAIR.

Considering that the annual exportation of mohair from this colony amounts to 10,000 bales, or 5,000,000 lbs., the importance of the article as a colonial product is at once apparent. It is evident that for a considerable period there has been steady progress year by year in both the quantity and the quality of this staple, and it is within the bounds of probability that the Cape will become the most important hair-producing country in the world. When Cape mohair was first introduced into England it had much in connection with it likely to give it a bad name. It was short in staple (a serious defect), and "kempy," lacking in proper lustre, and woolly; while the preparation had been so carelessly performed that it frequently came to market matted in lumps, and requiring fully three times more sorting than Turkish to make it equally fit for use. All of these defects are being rapidly removed. At present the chief fault of Cape mohair is its insufficiency of length, and no effort should be spared to remedy the defect. In most manufacturing districts it is admitted to be little inferior to the best Turkish in every other quality, but its shortness prevents its being utilized for many desirable purposes, except in conjunction with superior lengths from other countries. There can be no reasonable doubt that South Africa is peculiarly suited for the growth of mohair; and if farmers will only attend to the breed of their flocks and to the preparation of the hair it may hold its own against any in the world.

The exhibits of mohair may be said to have been satisfactory, and to indicate that in this article the Cape stands favourably. As with wool, the exhibits were all from the Eastern Province. True, some samples of Turkish mohair, and of Turkish and Cape mohair goods showed the existence of the defects above enumerated; but on the whole the exhibits were very encouraging. The goods exhibited by Mr. J. Hall, Port Elizabeth, and others, manufactured from Cape mohair, were very interesting, as showing how well adapted is the article for the best requirements.

The judges remark that, although the quantity of mohair was comparatively small, yet that they were satisfied the exhibits were equal in quality to anything the colony can produce. Some of the fleeces were perfectly free from kemp, of a full length staple, and brilliant lustre, and possessing that very soft mellowness to the touch which is a sure indication of pure breed, and of a class which commands the highest market prices.

OSTRICH FEATHERS.

The importance of the feather industry considered, the exhibits in this section were neither so numerous nor so fully representative as could have been anticipated or desired. Colonial interest in this staple, however, is not at present very active, and causes exist conducive to slight discouragement amongst producers. To some extent, like diamonds, articles of luxury, feathers have recently been in very limited demand in Europe, and as a natural consequence, as stocks have increased prices have fallen. A return of prosperity will doubtless revive the fashion and consequently the demand, and then we may fairly anticipate good trade for the different varieties and qualities. So far no other part of the world has shown either a marked capacity or a strong desire to enter into competition. Fitful attempts are being made in America and Australia, but the actual production of feathers is very small. The South African ostrich farmer may feel assured that the market for feathers must re-open, and common prudence should dictate the necessity of caution in dealing with his present interests. The trade has certainly undergone very serious depression, but it has occurred from causes beyond the control of the farmer.

The judges expressed surprise at the meagre exhibits of dressed feathers, and remarked that it is astonishing, considering the facility offered here for the production of dressed feathers at a cheap rate, that by far the larger portion are imported from England, the ordinary local price being excessive, and the finish inferior to that of the imported article.

SERICULTURE.

The exhibits of silk in the raw state were six in number, but only two of them conformed to the specified conditions. In order, however, to offer encouragement to the cultivation of the article, they were all permitted to compete, and the

otherwise disqualified ones were each awarded a bronze medal.

Mr. V. Roberts, of Uitenhage, who was awarded a gold medal, exhibited about half a pound of the raw article. The other exhibitor (name not stated), in the Natal Court, was awarded a silver medal. In quality and suitability for manufacture, both these exhibits were excellent. It is known from the reports of English silk-spinners that Cape silk is equal to any in the world. There would seem to be no reason why sericulture should not receive more attention in South Africa. With fair attention the silkworm thrives in most parts, whilst the leaves of the mulberry tree, its principal food, are plentiful everywhere. In Italy and some parts of France, where the climatic conditions appear to be similar to our own, sericulture is an important industry. In some instances it is the main source of livelihood; in others it seems to furnish the peasantry with a profitable addition to their ordinary avocations. At different times and places in South Africa, attempts have been made to make sericulture a permanent industry, as many people believe it might be made. Want of continuous and systematic effort, however, has precluded any important result. Some dozen years ago the industry was initiated in Natal on a comparatively large scale, and there was at the outset a very satisfactory production of the raw article. The difficulties of obtaining a ready sale for it, and other causes, led to the pursuit gradually languishing. Those experienced are nearly unanimous that sericulture may be followed in these colonies with fair prospect of profit. The Agricultural Societies throughout the colony might well offer encouragement, by including prizes in their lists for efforts in sericulture.

FABRICS MANUFACTURED IN ENGLAND FROM SOUTH AFRICAN MATERIAL.

This section was one of the most generally interesting features of the Exhibition, and to the mass of visitors must have been generally instructive. The quantity, variety and quality of the exhibits were astonishing and out of proportion to the other sections. The Executive and the public are no doubt indebted to Messrs. Savage & Hill, for well-directed efforts to make this department of real value to colonists. They unquestionably succeeded beyond measure, and the good work accomplished will probably extend far and wide throughout the country, and for many

years to come. The special value of these exhibits was to show to colonists the various uses to which our wools and mohair could be put, to show the different stages of manufacture, and the excellent quality of the goods manufactured therefrom. In these respects the section furnished a most useful school, and, in the words of the judges, "should stimulate our farmers in their efforts to improve their flocks until our wool shall no longer be a reproach to us, but command respect in all European markets."

On well-arranged stands, in the Western room, were to be seen our Cape and Natal wools in each progressive stage of manufacture into white and coloured blankets, hats, hosiery, tweeds, serges, coatings, trouserings, shawls, shirtings, buckskins, Bedford cords, &c. Some were in the piece, others made up into costumes, all beautiful in appearance, and encouraging in the capabilities for effort they furnished. Samples of mohair from Turkey and the Cape were shown in their manufactured state for purposes of comparison, while the fullest illustrations were afforded of the different processes of manufacture. The exhibits were most interesting; and their value was increased by the frequent attendance and explanation of Mr. Savage himself. The effects upon the interested groups of visitors seemed likely to be beneficial in stimulating to further effort and in teaching them the necessity of close attention to the improvement of colonial produce. What the value of wool will be at home depends upon what it can be used for, and this largely depends upon what condition it is in when it leaves the farmer. The manufacturer can never put to the best use, and pay the best price, for wool weak in growth, poor and uneven in quality, irregularly shorn and packed with dirt and burrs.

In addition to securing these exhibits, Messrs. Savage & Hill obtained some valuable minutes from the manufactures regarding the uses, merits and demerits of Cape produce.

The exhibits were so numerous that to enumerate the whole of them would be to compile a good-sized catalogue.

In this section some exhibits illustrative of the manufacture of wool and mohair, the property of the Albany and Graham's Town Museum, are worthy of mention. Similar illustrations of the treatment of mohair, from the well-known firm of Sir Titus Salt & Co., near Bradford, were exhibited by the Port Elizabeth Chamber of Commerce.

The articles manufactured from mohair were not in such variety as those from wool, but such as were on exhibit were beautiful to look upon. Mr. J. Hall, of Port Elizabeth, showed mohair in various qualities, in the raw state, and

also as manufactured into rugs, wrappers, velvets and different kinds of ladies' dress goods. These exhibits were regarded as "simply splendid" by the judges, and as a special distinction, Mr. Hall was awarded a gold medal and also a bronze medal for mohair in the different stages of manufacture.

Messrs. Longworth and Bairstow, of Port Elizabeth, also exhibited tweeds, manufactured from Cape wool in the West of England.

Mr. W. C. Thompson, of Port Elizabeth, and Mr. Davis, of Graham's Town, also exhibited piece goods manufactured from South African products.

In concluding this report the judges remark:—"We wish to point out that it was impossible for us to mention every exhibit in detail, and place on record one regret, that among the exhibits we find no cotton or silk goods, these two important classes being represented by the small exhibits of Valentine Bros. and Wm. Holdstock. It is a matter of fact that cotton can be grown in South Africa equal to the Sea Island, and silk equal to the best Italian, the climate and soil being admirably adapted for the production of both. The question naturally occurs to us, should we not manufacture them ourselves? The trade in blankets is a large and important one, and should be able to support at least one good factory in the colony. Take the value of the raw material from which the above blankets are made, and charges amounting to almost as much before it reaches the manufacturer, add manufacturer's profit and a heavy duty in order to get back our own wool in the form of blankets, it will be at once perceived that we ought soon to become exporters of blankets at 1s. 6d. per lb., instead of the raw material at 2d."

THE MANUFACTURE OF BLANKETS.

The judges, it will be observed, make an important usggestion regarding the manufacture of blankets in South Africa. There seems every reason for believing that such an undertaking would be more or less a success. It might be difficult to compete with the English manufacturer in the better kinds of white household blankets, but, with coloured blankets, and the different kinds of rugs in use in these colonies, something might be done. The material is to hand in its cheapest form, water (an all-important article in this connection) is sufficiently plentiful and good, whilst the climate is admirably suited for the carrying out of the

different processes. These latter are comparatively simple, and a knowledge of them could easily be acquired by the intelligent portion of the coloured population. The establishment of blanket manufactories in different centres would be a benefaction to hundreds, if not to thousands, of the poorer classes in South Africa, who seem likely to increase from year to year. There is no reason why very primitive machinery should not be utilized at the outset. In England the hand-loom, warping-woof and the bobbin-wheel fitly preceded the more complicated machinery for manufacturing with uniformity, despatch and in quantity. Even now, however, there are but few parts of the blanket-making districts in Europe where the hand-loom has disappeared from the household. There appears to be no reason why such excellent institutions as the improved spinning-wheel and the hand-loom should not be familiar in the households of the poor, but industrious, classes in this colony. It will probably be a long period before the manufacture of cloth and other kinds of textile fabrics requiring complicated and expensive machinery and skilled technical labour can be profitably carried on.

Within the last few weeks some Norwegian settlers at Marburg, Natal, have succeeded in manufacturing blankets; and an effort is being made to form a company for the carrying on this industry; and it is intended to utilize water as the prime motive power.

During the latter period of the Exhibition Messrs. Nannucci & Co., of Cape Town, occupied a stand in the main hall, which daily attracted interested groups. The process of wool-carding and spinning, in their most primitive forms, were carried on by the female assistants. Articles were also made from the yarn in an astonishingly short space of time, dyed in an adjoining room, and completely finished.

LEATHER, HARNESS, SADDLERY, ETC.

The exhibits of these articles, which were in the fullest variety, served to demonstrate many things—amongst them that, Cape skins are equal to any in the world, but that from ignorance and carelessness they have for a long period borne a reproach, rendering them nearly valueless in too many cases. For years the importance of care in the first stages of the preparation of hides and skins has been urged upon colonial farmers and butchers, but with very unsatisfactory results. Hence the necessity for, and the value of, such

exhibits as those of Messrs. Savage & Hill. The dressed, scab by skins, placed side by side with the best leathers, proved more than could a lecture or a political speech the necessity of a Scab Law; while the ghastly specimens of flaying (ruthless slashing) in South Africa, placed side by side with South American hides without a scratch, were sufficient to prove what we are losing by sheer carelessness. It cannot be too earnestly impressed upon those interested that a hole in the hide, a brandziekte mark, or a gash in flaying can never be remedied.

The exhibits altogether seemed sufficient to convince one that leather may be prepared in the colony as cheap and as well suited to colonial requirements as anything imported. The exhibits of Messrs. Mossop & Garland, Cape Town; Messrs. Jones, Port Elizabeth; Mr. Lyle, Natal; and others were satisfactory, as furnishing proof. The barks, and other necessaries in preparation, are abundant.

Messrs. Mossop & Garland, Mr. J. Garlick, the Cape Town Saddlery Works, Messrs. W. Jones, Port Elizabeth; Mr. G. Eirwood, King William's Town; Messrs. Bisseker, George & Co., Port Elizabeth; Mr. Maloney, King William's Town; Messrs. Luke & Co., Graaff-Reinet; and Mr. R. Sutherland, Graham's Town, were the principal exhibitors of leather and leather goods.

Without particularizing, it may fairly be said that a great success was achieved in this section.

In reporting on these classes the judges expressed satisfaction at the number and quality of the exhibits, but called attention to the paucity of such articles as saddle and hand bags, valises, leggings, &c. They conclude with the following important observations:—"Taking the exhibits in leather and leather goods altogether, we consider them very satisfactory indeed; in fact, with such fine specimens before us, we are of opinion that in the near future we should not only cease to be importers but become exporters of the class of goods reported upon."

SOAP AND CANDLES.

The manufacture of common soap for use on the farm might be more generally undertaken in country households. The process is simple, and the materials are usually to hand, and are very frequently wasted. There is not usually such an abundance of tallow as would justify attempts on a large scale, but there is frequently much fatty matter usually

regarded as useless, that by a simple process of refinement could well be utilized for this purpose.

The Australian exhibits (by Messrs. Scholefield, Port Elizabeth) of high-class perfumed soaps indicate that, our neighbours, at the Antipodes, are considerably in advance of us in this pursuit.

The recommendation of the judges regarding caustic soap should receive consideration. The candles from the wax berry deserve attention.

MILLINERY, DRESSMAKING, TAILORING, ETC.

The competition in these classes was limited. The first named industry is an important one; and it seems matter for some surprise that the judges should have to express their regret that so few large firms competed. There must be many establishments throughout the country where excellent work in these branches is a specialty. The principal exhibitors were Messrs. A. Dickson & Co. and Messrs. Cleghorn & Harris, Port Elizabeth, both of which firms showed, in handsome glass cases, some really good articles.

CLASS II.

Vegetable Products and Manufactures Therefrom.

WOODS.

The collection of colonial woods was large and fairly representative. While not so complete as might have been desired, it was sufficient to indicate the scope of our resources, and to leave the impression, that we have had so much aid from Nature that it is our own fault greater progress has not been made. In the utilization and exportation of colonial woods there is a mine of undeveloped wealth. The most important specimens on exhibit were from the Government Departments, and included samples from the Knysna and Perie Forests. The specimens of the real yellowwood (which embraces fully half of the colonial timber), sneezewood, ironwood, stinkwood, pine, pear, assegai, camphorwood, box, &c., were fine, although some of them had not been properly prepared. The extended cultivation of some of the varieties is specially recommended by the judges; indeed it is highly desirable that much greater attention should be paid to tree planting generally. Those conversant

with old colonial records will be aware that so long ago as 1689 the Dutch Government, then in power, exhibited its anxiety at the destruction of the forests and bush, and initiated measures for the encouragement of tree cultivation. We have it that, in 1711 the Council ordered that a condition in title deeds should be enforced requiring young trees to be planted in equal numbers to those cut down.

The judges very properly call attention to Cape box wood as exhibiting valuable qualities. It is well known that, in Europe, this and other hard woods are getting scarcer, while the demand for them for engraving purposes is rapidly increasing. There is good reason for supposing that box, and many other hard colonial woods are admirably suited for this purpose. The carriages, wagons, and furniture, made principally from colonial wood, and shown at this Exhibition, demonstrated the suitability of our timber for many trade and domestic purposes. The remarks of the judges furnish subject for careful reflection.

WINES, SPIRITS, ETC.

The production of wine has, for a long period, formed one of the important industries of the Western Province of this Colony. At present, owing to a variety of causes, this industry is not so prosperous as could be desired, while the recent appearance of the destructive phylloxera in the vineyards is sufficient to cause serious anxiety to those colonists interested in wine-making. It is also an unfortunate fact that, there is an immense quantity of Cape wine for which there does not seem a near prospect of a market. Like Cape wools, owing principally to a want of care in the preparation by the wine growers, our wines are not in favour just now. It would be well for the community if a taste should be created for the light Cape wines in preference to imported liquor; but there is not much prospect of this result until the quality is much improved.

It is maintained by some that, there has been great improvement in the production of wines and brandies in recent years. Others aver that, the standard reached is not so high as that of a quarter of a century ago.

So far as these exhibits indicated there would seem reason for assuming that some progress has been made. It is clear, though, that there is scope for further effort in this direction, and that the Government may well continue to encourage the introduction of experts and specialists to render assistance.

The exhibits of wines and spirits made up an extensive collection. Most of the principal producers were represented. The samples were representative of the chief varieties and brands of sweet and dry wines, and new and matured spirits. The labelling of the bottles and the care exhibited in the finish of the articles was a pleasing feature, bearing in mind the custom of some years ago.

Mr. Monoghan, Uitenhage, exhibited a few samples of colonial-made champagne—somewhat of a novelty. Some small samples of gin and whisky served to show what may be done with maize and other colonial grain.

The principal exhibitors were Messrs. H. C. Collison, Cape Town; Mr. H. Gilmour, Constantia; Mr. E. K. Green, Cape Town; Messrs. J. H. and J. van Ryn, Cape Town; Messrs. Cloete & Co., Ohlsson & Co., Letterstedt & Co., Cape Town; the Port Elizabeth and the Paarl Wine Associations; Mr. P. Toens, Worcester; Messrs. Aspeling & Co., Port Elizabeth, &c.

ALE AND STOUT.

Very little of interest is to be said regarding the exhibits in this class. The colonial ales do not seem to get beyond a certain standard of excellence, although there seems a likelihood of their becoming quite as popular as the imported, if the improvement can be effected. With the exception of an exhibit by Messrs. Cloete & Co., the porters and stouts were of indifferent quality.

COLONIAL VINEGAR.

There were only two exhibits of this article, both good, and nearly equal in quality.

Mr. O. Crawford, Port Elizabeth, was awarded a bronze medal, the judges considering his exhibit best for general purposes. Honourable mention was made of the other exhibit—by the Paarl Wine and Brandy Company.

There is, at present, a large importation of pickles and other articles for which vinegar is used.

CEREALS, MEAL, FLOUR, ETC.

In a country with such magnificent agricultural resources as this, an extensive and varied exhibit of these articles might have reasonably been calculated upon. Such, however, did not prove to be the case. One cause assigned by the judges was, the fact, that harvesting generally was

scarcely in operation, and was not concluded at the opening of the Exhibition. Such exhibits of cereals as were to hand, offered great encouragement, and seemed to justify the opinion that with all its drawbacks South Africa can produce grain not inferior to the best from other climes. The growth of wheat, and its manufacture into food stuffs, is a subject of great consequence to the whole colonial community; and everything tending to throw further light upon the causes retarding its successful cultivation and its profitable manipulation, should be diligently inquired for. That there are many drawbacks to profitable wheat growing has long been known. In many parts the agriculturist has met with much likely to discourage effort. In many other countries, however, difficulties have been overcome and obstacles surmounted which, at one period, seemed as great as those facing us here. Little worth having in this world is obtainable without persistent effort; and the necessary experience to enable this country to produce sufficient wheat for its own requirements will, probably, only be obtained after much patient experiment. At present the continuation of abundant crops in Australia is sufficient to handicap the colonial producer in regard to prices, but it will be an extraordinary thing if this continues for any very long period.

The judges, very properly point out that, most of the exhibitors of wheat fail to properly name or describe their exhibits, and as wheats grown on different soils have a distinct appearance, it would have been useful to judge the effect of soil on the growth; while much interest would have attached if the yield, per acre, or the return per bushel, had been given.

Some exhibits of Australian wheat by the Port Elizabeth Mill Company were exceedingly interesting. The quality was superb.

The exhibits of meal and flour were, in the opinion of the judges, the best in quality ever shown in South Africa. They were all so even in quality that it was difficult for the judges even to arrive at any thoroughly satisfactory decision.

The best samples of meal and flour made from Cape wheat were those of Messrs. E. & J. Atmore, of Woodstock. They were awarded a gold medal. A special gold medal was awarded to the Port Elizabeth Steam Mills Company, for a splendid sample of flour made from Australian wheat.

Mr. Dumbleton was awarded a bronze medal for oatmeal, and the Natal Chamber of Commerce for arrowroot.

TOBACCOS, CIGARS, ETC.

Until comparatively recently the cultivation and preparation of tobaccos have not, in South Africa, been attended with very satisfactory results. There are few parts of the country where the plant will not grow well, and for a number of years a very inferior kind has been grown in considerable quantity. The extraordinary circumstances of the country, however, seemed to preclude any systematic effort to improve the quality of the leaf, and, what is of primary importance, to secure the most improved mode of final preparation. An impression seemed also to prevail that there was no possibility of rendering the article of much account even for colonial requirements, much less as an export. Recent experiences have served in a large measure to dispel this erroneous impression, and experts from other countries, and practical men here, have shown that it is neither the fault of the soil nor the climate if we do not produce tobacco equal to any in the world. At present South African grown tobacco is in increasing favour, and it has already displaced many kinds formerly imported in large quantity. Much scope for effort is still presented, but evidence is forthcoming that great strides in the improvement of the commodity may fairly be anticipated. It has been decided to place a good exhibit on the London Exhibition, where it will be manufactured, and the results cannot fail to be of great consequence to the future of the industry. What we lack, mostly, is the means of final preparation. Experts advise that the tobacco should be exported in its raw state, as at present the leaves are damaged by inexperienced treatment. As an indication that colonial tobacco is no longer despised at home, we have the statement, on apparently good authority, that some grown in Kaffraria has realized 4s. per lb. in the London market.

The specimens on exhibit, while in all respects excellent, cannot be said to be the very best the colony can produce. They included the principal varieties but not the highest qualities.

Messrs. Ebert & Co., Port Elizabeth, showed excellent snuffs and tobaccos of colonial manufacture. They also exhibited a very interesting collection of pipes made from colonial woods—principally "Kree" wood. From the specimens of native wooden pipes one sees so frequently, it may be assumed that, there are many colonial woods eminently suited to the requirements of the pipe manufacturer.

Messrs. Chetty & Co., of Port Elizabeth, exhibited the process of cigar making from imported leaf, and attracted interested groups of spectators.

Messrs. Nathan & Co., Port Elizabeth, also carried on the process of cigar and cigarette making at their stand. They had on exhibit some good samples of articles manufactured in the colony, and tobacco in its raw and manufactured states.

Messrs. Cohen & Schmidt, Cape Town, however, obtained first honours for samples of colonial manufactured cigars and tobaccos.

Much merit attached to the other exhibits in this class, particularly those from Natal.

A tobacco cutting-machine for cutting "roll" or Boer tobacco, was exhibited by Mr. Arthur Heatlie, Glen Heatlie, Worcester. It is his own invention and construction, and was strongly commended by the judges for its ingenuity, simplicity and utility.

JAMS, ETC.

Within the present generation jam making and fruit preserving have become, in England and America, an important industry, employing thousands of hands, and calling to its aid the most recent scientific research. The consumption of the articles has now become so general that their manufacture has gradually slipped from the hands of the individual housewife, whose specialty this, at one time, was peculiarly her own. Modern requirements demand more extensive appliances, and a wider range of variety of production, than could be accomplished in the home. Old colonists will remember how, in the early days, fruit preserving was performed at home with such simple appliances as the kitchens of the period furnished, the imported article being almost unknown. Ever alive to supply, if not to create a want, the merchant in course of time induced a demand for the manufactured article from Europe. During the last quarter of a century the importation of jams and preserved fruits must have been enormous. Now, however, there seems a probability that the effort to popularize the colonial product will meet with success. If genuine excellence in manipulation and wholesome material are the desiderata, and prices compete fairly with the imported article, there is no reason why the colonial jams should not take the place of the imported varieties. The exhibits of Messrs. Jameson, of Durban, Messrs. Hill, Cape Town, and

Messrs. Kelly, Port Elizabeth, sufficiently demonstrate the possibility of producing, in quantity, articles equal to the best from abroad. All these firms are conducting the business on an extensive scale and with the most recent appliances. The indigenous and acclimatized fruits of South Africa furnish material for jams of the most *recherche* nature. The finer and rarer varieties of purely South African fruits should find a place in the European market, instead of being tabooed or neglected because they are at our doors. It is doubtful whether an unbiassed European judge could find anything from the famous Home firms superior to the Natal jams of Messrs. Jameson or those of Messrs. Hill, of Cape Town.

The exhibits of dried fruits were good. Messrs. Cartwright, Cape Town, Mr. De Smidt, Graaff-Reinet, and Mr. Marais, Worcester, showed excellent samples.

The American Fruit Drier or Evaporator, exhibited by Mr. W. Hume, Port Elizabeth, is one of the labour saving appliances that ought to find favour in this country. In many parts excellent fruit is abundant, and by the use of such a drier much good food might be saved from waste, and made a source of profit to the grower. The appliance underwent satisfactory tests, is easy of manipulation, and of reasonable cost. It can be used for potatoes, tomatoes, and other esculents. The drying is accomplished in a few minutes, while the article retains its full flavour—a most important desideratum. An apple parer and slicer, and a peach parer were also exhibited, and are amongst those American inventions deserving of more attention by the progressive agriculturist and horticulturist. It does, however, appear a piece of grim satire that in such a fruit-producing country as this, we should import not only thousands of cases of the article from the States annually, but also the appliances for dealing with our fruits. Probably not until the preserving and preparing of fruit becomes a permanent industry, carried on in earnest, instead of a fitful occupation, taken up and dropped in short periods, shall we find a remedy for the present anomaly.

SEEDS, BULBS, FLOWERS, ETC.

Messrs. Smith Bros., of Port Elizabeth, had a magnificent collection of imported and colonial seeds, bread and fruit plants, &c., most creditably arranged and classified. The show was probably the best and largest ever seen east of Cape Town. There were about twenty varieties of maize,

with sample cobs of each. The collection also included a large assortment suitable for the production of fodder for the silo—such as speigula maxima, Bokhara clover, Italian rye grass, trifolium incarnatum, &c. In such a country as ours one imagines increased attention will be given to the matter of ensilage. In many parts of South Africa, particularly in Natal, the experiments with ensilage have been thoroughly successful. Many of the vegetable seeds shown by this firm were exhibited for the first time here. The variety of flower seeds, mostly imported, was simply astonishing.

Mr. R. Templeman, Cape Town, showed a very large, well-arranged, and excellent assortment of bulbs, seeds and everlasting flowers.

Messrs. Carter Bros., the well-known London seedsmen, exhibited about one hundred samples of grain, including five samples of English wheat; also roots of mangel wurzel, &c.

Messrs. Ryland and McMasters, London, exhibited a small case of agricultural seeds, of which wheat was an interesting feature.

CONFECTIONERY, ETC.

The manufacture of confectionery would seem to be an industry furnishing scope for effort in these colonies. There is a steady demand for the articles, which have been imported from Europe in large quantity, but it is to be assumed of doubtful quality for many years.

The principal exhibitors in this class were the Port Elizabeth Steam Confectionery Works, Messrs. Hill & Co., of Cape Town, and Messrs. Jones, of King William's Town.

For general excellence and extensive variety these exhibits formed the best collection ever shown in South Africa. The exhibits of the King William's Town firm included seventeen kinds of lozenge; nine of cream work; ten jujube work: and about thirty varieties of boiled goods. All the articles were effectively finished, and apparently of much more wholesome composition than most imported sweets.

FURNITURE, ETC.

The principal exhibitors of furniture were Messrs. Isaacs & Co., Cape Town, and Messrs. J. Brister & Co., Port Elizabeth. Both of these firms achieved a great success, and are deserving of the fullest recognition for their efforts

to show their business capacity and to prove what beautiful and useful articles may be made from colonial woods.

Messrs. Isaacs showed some splendid drawing-room and bed-room suites in yellowwood, laurelwood or stinkwood, all made in the colony.

Messrs. Brister showed furniture of dark stinkwood presenting a particularly handsome, solid appearance. A specially interesting feature were a number of parts of pianofortes made by Messrs. Brinsmead & Son, of colonial stinkwood. These instruments were of beautiful appearance and of a quality of tone in keeping with the high repute of the makers.

The judges in their report state that, the articles made from colonial wood are very excellent, the workmanship and finish being of the highest order, and standing prominently forward as an encouraging sign for colonial construction.

There were some exhibits in this class from the Native Industrial Institutions, which are referred to elsewhere.

CARTS, CARRIAGES, ETC.

This section proved an interesting part of the Exhibition, although the exhibits were not in great variety.

The exhibitors were Messrs. Deas Bros, Oudtshoorn; Mr. P. J. Retief, Paarl; Mr. C. Wahl, Paarl; Mr. Randall, King William's Town; Mr. Coffin, Graham's Town, and Mr. A. P. Brink, Paarl.

The exhibits displayed first class material and workmanship and showed that for vehicles suited to colonial requirements South African makers cannot be surpassed.

DAIRY UTENSILS.

Messrs. Ryall & Co., Port Elizabeth, exhibited on behalf of Messrs. Silber and Fleming, London, the utensils for a model dairy. The articles, 37 in number, appeared to include all that is wanted, and to be designed and finished in the most approved fashion. The collection included churns of different kinds and sizes with the recent improvements, butter forcers, workers and prints, milk cans, pails and measures, cream skimmer, &c. One of the things that strikes the new arrival in this colony is the scarcity and high price of such important domestic articles as milk and butter. At some seasons of the year they are absolute luxuries and beyond the reach of the ordinary consumer. As a consequence the merchant has to aid the agriculturist; and the spectacle is often presented even in the house of

the farmer, of the daily consumption of tinned milk from Switzerland and canned butter from Denmark. This is a condition of affairs that should not continue in an agricultural and pastoral country such as this is. Systematic effort, with improved appliances and the benefit of past experience, should furnish the remedy speedily.

FIBRES, GRASSES, ETC.

It is a fair assumption that the extensive natural resources of these colonies are still only imperfectly known, and, consequently but partially developed. There is, however, sufficient evidence to warrant the belief that many of the shrubs, grasses, fibres and barks may be made to yield products of much commercial value. Many parts of the colony are rich in indigenous and acclimatized flowers and plants, from which may be extracted articles of use in perfumery, medicine, &c. It is somewhat to be regretted that larger exhibits in this branch were not forthcoming. They would have lent additional interest to the Exhibition, while assisting in directing attention to the ample field for research open to scientific men. Such exhibits in this section as were to hand, however, were interesting as showing the scope there is for new industries. The judges presented an able report, which is reprinted in this volume, and is well worth perusal.

MODELS, ETC.

The models and designs formed an interesting and instructive feature of the Exhibition.

Naval objects were as usual favourites of the constructors. The Castle Steamship Company exhibited splendidly constructed models of two of the largest and newest of their steamers—valuable as showing the progress and present condition of this class of marine architecture. The Union Company also exhibited well-executed models, on a large scale, of two of their modern ocean steamers. Mr. N. G. Knowles, Cape Town, had on exhibit a really beautiful model of a North Sea trawler.

The Kimberley models were remarkable, and are specially referred to elsewhere.

Messrs. Quick & Thorogood, Port Elizabeth, exhibited a most creditable and carefully executed model of a colonial buck wagon made of ironwood, yellowwood, stinkwood and assegai. This model has been sent to the Home Exhibition.

Some models of windmills and pumps were very well finished, and showed the mode of working very clearly.

Various other models were exhibited, all displaying merit. One of these—a model of certain woolwashing machinery—and made at the Uitenhage workshops, is deserving of special mention.

A model of the proposed improvement of Port Elizabeth Harbour, in accordance with the plans of Sir John Coode, also formed an interesting exhibit.

MATCHES.

Match-manufacturing is an industry of recent growth in South Africa. Factories are established at Wynberg, Port Elizabeth and King William's Town, all employing many hands and producing a creditable article. These colonial matches seem likely to come into extended use, the prejudice against them rapidly disappearing. Since the earlier efforts great improvements have been made in the manufacture, until now matches are presented to the public in no way inferior to the imported ordinary article.

The Port Elizabeth Match Factory provided an interesting novelty to visitors, by having a number of female assistants engaged at their stand, showing part of the process of manufacture.

At present pinewood is imported and used for making matches, and spruce for the boxes. Possibly some of the colonial woods will eventually be used for these purposes.

The judges ascertained that the Wynberg match boxes were imported, while the Port Elizabeth Factory makes its own, and therefore, considering the latter the nearest approach to a colonial manufacture, awarded it first honours, highly commending the two others.

BREAD, CONDIMENTS, ETC.

The section devoted to bread, ornamental pastry, pickles, sauces, &c., did not attract much attention, there being no exhibits whatever of most of the articles.

The best biscuits exhibited were those of Messrs. Owens, of Durban—an excellent article.

The chutnies and curry powders were not considered worthy of commendation.

Tinned fish was represented by a few small tins exhibited by Mrs. Machlan, Cape Town.

Mrs. Blewitt, of King William's Town, exhibited Kaffrarian Worcester Sauce. The article seemed fully equal to

most of the imported kinds, and is probably composed of much more wholesome ingredients.

The apathy of exhibitors in this class was a noticeable feature.

HONEY.

There seems no reason why bee-keeping should not be a profitable pursuit in this colony. Science has now assisted the labours of the industrious little insects, which with trifling attention thrive well in most parts of the country. Many colonial wild flowers growing in profusion are rich in honey-making materials. For good honey and bees-wax there is a regular demand at fair prices.

Dr. Stroud, Port Elizabeth, exhibited some good samples in the comb. This gentleman has made commendable efforts in the promotion of bee management. He exhibited an improved sectional bee-hive, of colonial design, furniture, pamphlet, &c.

HAMMOCKS, NETWORK, ETC.

Mr. George Slatem, of Port Elizabeth, was awarded a silver medal for an excellent assortment of hammocks, cots, nets for fishing, bird-catching, &c. Work was carried on at the Exhibition.

There were other exhibits, but this section does not call for special notice.

HATS, ETC.

Mrs. Gradwell, Somerset East, and Mr. Alex. Goldswain, Peddie, exhibited colonial-made straw hats. The material (mealie leaves) for the rougher kind of article is easily obtainable in the colony, and scope for another industry seems to be presented.

CLASS III.

MINERALS AND METALS, AND MANUFACTURES THEREFROM.

COAL.

Coal is a mineral widely distributed throughout the South African colonies, but to the present there has not been much systematic effort to develop the different fields. The abundance of wood suitable for household requirements and the limited demand for coal in quantity has

precluded much attention to the matter of future fuel supply. The difficulties of transport have also proved an obstacle to profitably placing the colonial article in the principal markets. Even now coal is imported from England to as far north as Kimberley. At different times mineralogical surveys have been made with a view to more precisely determine the extent of the colonial coal supply, and some valuable reports exist. Repeated trials have also been made to ascertain its value as fuel compared with English coal. Much that is important to determine still remains somewhat uncertain, but there is evidence of a desire for fuller and clearer information on the different phases of this important subject.

The exhibits of colonial coal consisted of five tons from the Cyphergat Mine, Burghersdorp, and a small quantity from the Newcastle Fields, Natal. Small specimens were also shown from Molteno and other places. Not much importance seemed to attach to any of the exhibits.

The Cyphergat coal was used for the purpose of producing the motive power for the machinery exhibits, and seemed to give satisfaction.

GOLD, MINERAL ORE, GEOLOGICAL SPECIMENS, ETC.

South Africa is rich in nearly all metals and minerals. At different times specimens of the more important ones have been sent to Europe and assayed, with very varying reports. Diamonds, gold, copper and coal have, so far, proved the most profitable.

The most interesting specimens (next to diamonds) to the ordinary visitor were the samples of gold and gold quartz from the Transvaal and other gold fields. The Standard Bank exhibited Transvaal gold of considerable value, and furnishing a clear indication, were it needed, that the precious metal abounds in that Republic. The Government of the Transvaal some time ago sent down a large piece of gold reef to the Port Elizabeth Chamber of Commerce, and this specimen was placed on exhibit In the Natal Court there were numerous specimens of gold-bearing quartz, all of great interest to the mineralogist. Copper, iron, lead, silver and other kinds of ore, lime, marble, &c., were also exhibited in this Court. In the main hall there was an extremely interesting collection of mineralogical and geological specimens exhibited by Mr. Fletcher, of the Public Works Department; also a number of specimens sent by the Geological Society of

Australia. Messrs. Lennon & Co., Port Elizabeth, exhibited a case of specimens from different parts of Europe and America, well classified and described. Messrs. Lilienfield Bros., Hope Town, showed specimens of crocidolite; Mr. J. A. Vermaak, Burghersdorp, iron ore; Mr. G. Vice, Molteno, samples of limestone, saltpetre, iron, gold, silver, copper, asbestos, &c. The Colonial Government exhibited marble and crocidolite; and Mr. P. H. Rademeyer silver ore and other minerals from his farm at Bedford. Mr. J. Young, Hankey, showed limestone, chalk and other minerals; and Mr. Stewart crocidolite from near Prieska. Some valuable geological specimens were also shown in the Kimberley Court. Interesting exhibits of copper ore were also on view from the mines in Namaqualand. Colonial building stone of different kinds went to make up a collection which unquestionably added interest to the Exhibition.

SALT.

There are few articles in ordinary request so plentifully distributed thoughout the Colony, the Free State and the Transvaal, as common salt. It is usually easily obtainable, and requires little preparation beyond the separation of sand and other earthy deposits. In many parts, as near Molteno and in Alexandria, saltpetre, alum and Epsom salts and other earths of interest to the drysalter are procurable in quantity. Their preparation for the market may furnish an important minor industry.

Of the exhibits of salt in the coarse, medium and finer conditions, those of Messrs. Hitzeroth Bros. and those from the Bethelsdorp Salt Pan were very similar in quality. The former being in much better condition, however, was awarded the first prize.

GUNS AND RIFLES.

Mr. John Grainger, of Port Elizabeth, was the only exhibitor of colonial made guns and rifles. The articles were splendidly finished. In a country where firearms are so generally in request, there should be scope for the manufacture of these and similar articles.

STONE AND MONUMENTAL WORK, ETC.

Mr. Gough, Port Elizabeth, exhibited some splendidly dressed stone from the Coega quarries; and made other exhibits in this class. An obelisk, cenotaph, tomb and

headstones, &c., showed that we have excellent marble in the colony, while Mr. Gough displayed much ability and care in the working of these articles.

There was no exhibit of glass-ware. The material for making the commoner kinds of glass exists here in quantity.

BRICKS, TILES, POTTERY, ETC.

For many years we have been too much dependent upon importation for our supply of the best kinds of these articles. The commoner descriptions have been made, but progress in the full utilization of the excellent clays abounding for high-class goods has not been so great as could be desired.

The exhibits in this class were quite satisfactory as proving the excellence of the material to hand. It was evident, however, that there is scope for improvement in manipulation and finish.

Mr. J. P. Lucas, Graham's Town, showed fire-bricks, flower-pots, gutter and turret bricks, culvert bricks, stove-backs, &c., all creditably produced. He had also special exhibits of fire-clay goods, such as flooring tiles, stove tiles, and drainage goods. Some specimens of pipe clay, red clay, b ue clay, &c., were considered by the judges capable of producing (with proper manipulation) high-class articles.

Mr. Joseph Arrow, Port Elizabeth, and the Public Works Department, Kimberley, also had some creditable exhibits of bricks.

JEWELLERY, ETC.

The exhibits of jewellery and its cognate branches, especially the manufactures from colonial gold and other productions, formed a most interesting and pleasing feature of the Exhibition. They were interesting as showing the immense strides made in these artistic industries during the last decade, and pleasing as exhibiting what exquisitely beautiful ornaments may be made from our own products.

Most important in this section were the exhibits of Messrs. A. Fischer & Co., Port Elizabeth. This firm evidently entered into the spirit of the Exhibition in genuine earnest, and deserve full recognition for their efforts to show their own special wares and to furnish visitors with some insight into the methods of manufacture and repair. In order to illustrate the mechanical parts of their trade, which includes all branches of the manufacture and repair of jewellery, watches and clocks, metal-work within the usual scope of the goldsmith, the silversmith, the lapidary, the enameller,

the die sinker, engraver, chaser, embosser and designer, workmen carried on their ordinary routine in the presence of the public, at the stand in the Western room. Although of special concern only to those who could follow the processes of the craftsmen, there was yet much of interest to the general public in watching workmanship in material not usually within reach of the public eye. Visitors had an opportunity of watching the working of the wheel-and-pinion cutting machine; the turning lathe for shaping metals and fittings; the mandril used for jewel setting in watch plates, &c.; and a number of other practical illustrations in the mechanism of this important and artistic branch of trade. Throughout the period of the Exhibition this stand attracted interested and inquisitive groups of spectators beyond the usual number cognizant of the trade.

The exhibits at this stand were of an elegant and high class character, and many of them possessed, to most spectators, the additional charm of novelty. Amongst the clocks were two which obtained special attention. One was a "one year clock" made by the firm in the colony, in, case of colonial wood, which is so constructed as to resist variations of temperature and keep up to the standard of regulation for 365 days from the time it is wound up. As the firm point out, the great use of such a clock in a public building is obvious. The disadvantages and difficulties of periodical windings in clocks in church and other towers often prove a source of great care and vexation. The other horological novelty was an electric clock, the works of which received their motion direct from the electric current from a battery at the stand. By means of this interesting instrument the time was marked on large dials in conspicuous positions in the hall of the building, and proved of great convenience to the public. The clock has a pendulum beating seconds. It will doubtless be remembered that when this class of instrument was first exhibited in London it was regarded as a great achievement to measure by half-minute jumps. A time ball in connection with this clock was also an interesting novelty.

The firm deserve credit for their exhibits of electric bells and minor apparatus for domestic requirements, and this part of the stand was closely examined and experiments frequently made. The jewellery manufactured in the colony by the firm was beautifully and artistically executed. Some specimens of crocidolite engaged much attention. This stone is to be found in quantity in Griqualand West and adjacent parts, but until a few years ago it has not engaged

much attention for purposes of ornament. It seems probable, however, that it will now become popular in Europe. Amongst the raw material on exhibit were specimens of South African gold in quartz, smelted and rolled; mahogany seeds from the Zambesi and Transvaal; brilliant seeds from the West Coast of Africa; seeds from St. John's River; and various native woods. The specimens of copper-plate engravings, &c., were most creditable, considering that this branch is not yet beyond its infancy in this colony.

The designs for the prize medals, which were accepted by the Executive Committee, and other specimens of the art of engraving, showed artistic effort worthy of unqualified commendation

Messrs. Joseph & Sons, of Port Elizabeth, exhibited a magnificent range of diamond and gold jewellery, gold and crocidolite jewellery—all elegantly and artistically finished.

The exhibits of Mr. R. W. Shaw, of the Paarl, consisted of handsomely-executed work in gold and silver; ostrich egg-shells, mounted in silver; colonial wood, mounted in argent; clock, &c. A novelty at this stand consisted of a silver-mounted tobacco jar, made of twenty-three kinds of colonial wood.

Mr. B. D. McGill, Port Elizabeth, exhibited some creditable work in jewellery from South African gold; also diamond rings, brooches, &c.

Mr. H. C. Galpin, Graham's Town, exhibited diamond rings and diamond pendants of colonial stones, gold rings, brooches, bangles, &c. Some colonial beetles, mounted as brooch and ear-rings, and other articles of novelty, appeared to great advantage and displayed very creditable effort.

Mr. J. S. Wilcox, of Graham's Town, had on exhibition excellent specimens of engraving in metal and ivory; ornamental engraving; gold and silversmith's work, electro-plating and gilding; jewellery made of South African gold, &c. All the workmanship was colonial, and much practical skill and ability seem to have been displayed, in design and workmanship.

These exhibits of colonial-made jewellery and other articles in variety showed what can be done in the colony with gold and precious stones, and demonstrated that we have the necessary skill, taste and other requisites to hand for the satisfaction of all requirements. Ladies might reasonably initiate the custom of receiving presents of the goldsmith and silversmith's art only when made in the colony.

MACHINERY, IRON APPLIANCES, ETC.

The machinery annexe formed an Industrial Exhibition of itself, and was the centre of great interest to commercial men, agriculturists and visitors generally. To men with a fair proportion of the practical and the theoretical in their constitution, machinery will always be a source of interest. In its different forms and manifold uses it serves to demonstrate that the earth was made for man rather than man for the earth, and that there is no limit to invention and discovery of the forces of nature.

At first appearance the machinery room reminded one of the different Agricultural Shows throughout the country, but an examination of the exhibits revealed the fact that there was much specially interesting and instructive to be witnessed.

The most important exhibitors were Messrs. Howard, Farrar & Co., Port Elizabeth, who occupied a space of nearly 2,500 feet. This firm evidently entered thoroughly into the spirit of the Exhibition, and showed a collection of articles most creditable to their own business enterprise and most instructive to spectators. The exhibits included every form of agricultural appliance, from a steam thrashing machine in work at the Exhibition to the smallest casting. The most important of the exhibits had been made by the firm in Port Elizabeth; others had, of course, been made in Europe. Many of the articles were the manufacture of Messrs. J. & F. Howard, the well-known English makers of agricultural implements, and for whom the local firm act as agents.

There are few things so deceptive in appearance as machines of any kind, and it is only after lengthy trials under diverse circumstances that the real merits or demerits can be ascertained. To the mechanician the construction and quality of material offers some considerable indication, but the ordinary visitor is mostly dependent upon the repute of the manufacturers and the descriptions of the qualities of the machine.

The firm of Howard, Farrar & Co. have established a good reputation in the province, and the stamp on their articles is a reliable guarantee.

Amongst the exhibits was a six horse-power portable steam engine by Clayton & Shuttleworth, evidently well suited to colonial requirements. It can be made in various sizes and used for pumping, sawing, grinding and driving agricultural machinery. During the Exhibition it was made to drive a

four-foot thrashing machine, also well suited to colonial requirements. These machines are said to be the only ones capable of successfully dealing with colonial grain, of which they are capable of delivering ready for the mill about fifteen bags per hour. The engine and machine were frequently tested and appeared to fulfil all that is claimed for them.

The De Laval Cream Separator is the name of a novel Swiss invention, exhibited by this firm. By a process easy to manipulate the cream can be separated from the milk in an artificial manner in a short period, and, so far as the experiments demonstrated, with satisfactory results. Steam or horse-power being requisite to work the machinery, it is best suited for the dairyman on an extensive scale. The price is £45. Great interest seemed to be evinced by visitors at the trials which were made frequently during the period. This exhibit was highly commended by the judges.

The corn-grinding mills also seemed well adapted for colonial requirements. The larger ones were suited for small engines, and had steel and stone rollers. Others were suitable for horse gear or windmill; while some neatly constructed hand-mills are likely to find favour amongst the numerous small farmers throughout the country.

Three kinds of winnower were shown, all suitable for hand or horse power and adapted to hot climates.

Barrett's patent steel transport wagon formed an interesting exhibit, but was generally condemned by visitors as unsuitable to the country.

Boring apparatus, tube wells, pumps, hydraulic rams, &c., formed another part of the exhibits of great interest to farmers. Year by year the latter are becoming more alive to the absolute necessity in this climate of accepting every available method of utilizing natural forces and resources.

Single, double and three furrow ploughs were shown in great variety, excellent alike in design and construction.

Reapers, churns, ostrich food cutters, horse hoes, chaff cutters, &c., of the best material and in their latest improvements, went to make up a large and varied collection of agricultural appliances.

Improved belting in leather, cotton and canvas also formed an interesting exhibit.

The firm exhibited photographs of many of their manufactures; also castings and fittings in iron and brass.

They also exhibited windmills of their own construction, which have met with much favour in different parts of the colony.

Taken altogether, this firm exhibited an amount of

enterprise most commendable. They evidence faith in the prosperous future of this colony and display business ability worthy an encouraging reward.

Wrought ironwork and castings supplied evidence of enterprising effort worthy of high commendation. Some wrought iron gates, the work of Mr. J. Lewis, Vulcan Iron Works, Port Elizabeth, and designed for Exhibition purposes, displayed great skill in design and execution. These gates have been sent to the Home Exhibition.

Messrs. Mangold Bros., Port Elizabeth, deserve encouragement for their manufactures of ironwork in the colony. They exhibited many parts and pieces of machinery; corn grinding machines; pumps; boring tools, castings, &c.; all executed with great skill.

Messrs. Parker & Co., Port Elizabeth, exhibited agricultural implements and tools.

Mr. Donald Menzies, Cape Town, exhibited a colonial-made bicycle, which seemed a useful and durable article.

Mr. Simey exhibited farming implements made by Messrs. Norris & Sons, Stourbridge, all of which seemed of good material and well manufactured.

Through Mr. Simey, Mr. J. Shaw, Sheffield, England, exhibited samples of his patent fencing, posts and hurdles. Fencing of farms is not by any means general, but those farmers who can afford the necessary capital find it a great advantage. The inventor has visited these colonies, and the articles have been specially designed and constructed as the result. Large quantities of these articles are sent to Australia.

PLUMBERS AND TINSMITHS' WORK, GLAZING, ETC.

Exhibits in tinware, japanned goods, &c., manufactured by Messrs. W. & E. Alcock, Port Elizabeth, were most creditable. Similar remarks apply to articles of galvanized ironware, tinware, &c., shown by Mr. T. S. White, Cape Town.

Mr. P. Haymer, Port Elizabeth, showed a well-executed model of plumber's work and some interesting specimens of lead windows.

Messrs. Small and Morgan, of Port Elizabeth, exhibited a small conservatory to show the merits of the Simplex glazing.

WINDMILLS.

Considering the wonderfully successful results achieved in America and elsewhere in the endeavour to "harness the

wind," it is little matter of surprise that windmills are rapidly coming into general use in South Africa. They seem well calculated to perform important functions in these colonies, where, in most parts, the conditions of life are such as to render their aid a welcome accessory. During recent years their use and value have been placed beyond all question. Amongst the number in the market, however, it is extremely difficult to say which is the best suited to general requirements. Probably no particular one can be said to best fulfil *all* the varied purposes of colonial use, and the purchaser must select the one most convenient for his own wants and means.

Six windmills were exhibited and were at work outside the Exhibition buildings, so that the visitor had an opportunity of becoming well acquainted with them. The principle was the same with each, though of course they differed materially in form of construction and detail. All seemed well suited for the raising and distribution of water.

The different exhibits were the "Germania," by Messrs. Mangold Bros., Port Elizabeth; the "Manuel," by Mr. Geard, Graaff-Reinet; the "Stover," by the S.A.L. & M. Co.; the "Simplex" (2), by Messrs. Howard, Farrar & Co., Port Elizabeth.

The judges considered the "Simplex" the best on account of the superior arrangement of the wind vanes, and the facility with which repairs and renewals can be effected. They considered the "Germania" the next in order of merit, expressing satisfaction at the excellent workmanship.

The "Manuel" and the "Stover" were highly commended.

Messrs. Mangold Bros. and Messrs. Howard, Farrar & Co. showed a large variety of pumps, suitable for these mills; also for hand or horse power.

The frequency of long droughts should teach the necessity of being able to utilize the subterranean water supplies in existence in most parts.

SEWING MACHINES.

Sewing machines are now used for such a variety of purposes that quite a revolution has been caused in the workshop and the household since their introduction. It is noticeable that the earlier and important improvements of the invention came from America.

The Singer Manufacturing Company had a large stand in the Western room, where they exhibited machines for

manufacturing and household purposes; the different parts of their machines; and samples of work done on the spot.

Messrs. Ivy Bros., Port Elizabeth, showed a large number of Bradbury's improved machines for bootmaking, tailoring, dressmaking and kilting.

The Standard Sewing Machine Company, Port Elizabeth, also exhibited one of their machines.

Messrs. Briggs Bros., Port Elizabeth, had on exhibit a number of machines for trade purposes.

All the machines were well constructed, simple in the application of the necessary mechanism, and reasonable in price.

As labour-saving appliances they are invaluable.

CLASS IV.

Kimberley, Natal and Brazil Courts; Native Exhibits.

THE KIMBERLEY COURT.

Everything pertaining to Kimberley and the diamond industry will always possess a significant interest to South African colonists. From their discovery the Diamond Fields have exercised a material influence upon every part of the southern portion of this continent. For a comparatively long period many colonial towns were dependent upon them for the prosperity they enjoyed, and were closely associated with them in many important respects. A large portion of the enormous wealth obtained from the different mines became distributed throughout the country, and served to restore a condition of affairs that had to many colonists become very discouraging. When it is considered that diamonds realizing in Europe over thirty million pounds have been unearthed in Griqualand West, it may well be assumed, that the diamond industry has been by far the most important South Africa has ever known. The history of these Fields has been as marvellous as the imagination can well desire, and if related in strict accuracy would read like a wild romance. What their future is to be remains in the region of pure conjecture.

It is not therefore surprising that throughout the Exhibition interest in the Kimberley exhibits was remarkably keen. In many respects they proved a special feature of the Exhibition, and certainly attracted an extraordinary amount of attention.

The Kimberley Committee happily conceived and carried out the idea of providing working models illustrative of diamond mining in the early days (as they are termed now, though really comparatively recent) and as it is carried on at the present time. These models were well-constructed, and with the ready assistance of Mr. J. L. Fry, a gentleman thoroughly competent to explain, the visitor had an opportunity of becoming well acquainted with the more important processes of diamond mining. One model showed the system followed in 1873, when the Kimberley mine was only about 100 feet deep, and the one hundred separate hauling gears were each worked by four natives, and each produced a daily output of seven to ten cart loads only. Another model showed the cradle which in 1874 replaced dry sorting, and ten years afterwards was followed by the greatly improved rotary machines. A model of a horse whim of the primitive type served to show the process of hauling ground in 1874 to the period when the steam engine was utilized for the purpose. Another model showed the process of the present day in the shape of washing gear, pulsator, &c., and the wonderful aerial tram system. Mr. Blackbeard, managing director of one of the companies, exhibited a most interesting model of a gravitation washing machine, possessing many novelties and many ingenious improvements. This model, being on a large scale, was worked by steam in the machinery annexe and attracted close attention. Further illustration was afforded by some excellent photographs and plans showing the appearance of the different mines, &c., at various periods since 1872 to 1885.

There was also a most interesting collection of geological and mineralogical specimens from the different mines and river diggings; and some drawings of the mines based on surveys made in November, 1885.

Mr. J. L. Fry exhibited specimens in conchology, crocidolite and native curios, also gold quartz from the Tati—one of the earliest South African gold-fields.

Mr. W. C. C. Erskine exhibited paintings in oil, Mr. S. Stent architectural designs, and Mr. K. Tucker drawings, all intended for this court, but which it was found most convenient to place in other sections.

Cameeldoorn and olive woods, the principal article of fuel on the Fields, and pods containing cream of tartar seeds, were shown by Mr. W. T. Anderson; coal by Mr. H. Tucker; plumbago from the Marico district, Transvaal, by Mr. Sacke, &c.

Most interesting of all, however, were the diamonds themselves. These were exhibited in a glass case, carefully secured, and furnished a most attractive display. They represented a value of nearly £40,000, although the greater part were not by any means representative of the best articles obtained from the mines. They served the important purpose, however, of showing how diamonds appear when first found; the different sizes, colours and qualities; and how they can be imitated in appearance. Models were shown of the earliest and most celebrated stones that have been found in the mines. The diamonds shown were from Kimberley, De Beer's, Du Toit's Pan and Bultfontein mines, and were of all sizes and qualities. Amongst them were a large number obtained from illicit dealers by the Detective Department, and under the Diamond Trade Act forfeited to the Colonial Government. The illicit trade in diamonds is one of the most extraordinary phases of Diamond Fields life, and exhibits features of a most remarkable character. Some imitation diamonds were also shown, and demonstrated the ingenuity brought to bear upon rascally transactions.

There is to be an extensive and valuable assortment of diamonds shown at the Home Exhibition, where the process of cutting, &c., will be performed.

To the visitors interested in native history and tradition some greenstone boulders taken from a kopje about ten miles from Kimberley, and having upon them carvings by Bushmen of well-known animals and birds, were deeply interesting. This remarkable South African race, now rapidly disappearing, seem to have been *par excellence* the Nimrods of the country. In a lecture recently the Bishop of Graham's Town ably pointed out that although these Bushmen were looked upon by many as representing a type of humanity only a few links higher than the brute, yet as a matter of fact it is pre-eminently the Bushmen who have produced memorials of art and handicraft and knowledge of the secrets of nature in dealing with pigments and deadly poisons. Their remarkable powers of drawing and painting are said to have been confined to the royal caste, in which it has been handed down to our day from generation to generation. Their paintings are done only on sandstone—on the vertical fracture, not on the horizontal planes of strata—never on igneous rocks. They also made good pottery and wicker work, but their cunning and handicraft fell away through being hunted about themselves, and because of the introduction of European articles.

THE BRAZIL COURT.

The special exhibits of the Brazilian Centre of Agriculture and Commerce in the main hall were of great interest to commercial men. They consisted mainly of cigars, cigarettes and tobaccos, coffees in berry, roasted and ground, and sugars in crystallized and yellow. These samples were sufficient to demonstrate that South America is considerably in advance of South Africa in the production of these commodities.

THE NATAL COURT.

The Natal Court, tastefully and attractively placed in the Western room, possessed exhibits of deep interest to all concerned in the natural products and manufactures of South Africa. While it included the principal products of that fertile, well-watered and beautiful little colony, it fell short of being a fairly representative collection. Wool and mohair (next to sugar the main Natalian staples) were totally unrepresented, while samples of many other well-known exports were wanting. The principal articles on exhibit were sugar and tea, the former of which has been successfully cultivated and prepared on the coast-lands of Natal for many years. The sugar industry in that colony has undergone many vicissitudes, and much unfruitful labour and capital have been expended upon it in past years. It is now firmly established, but the extraordinarily large output in other sugar-producing countries during the last decade has minimized the demand for the article, and the consequence is that prices are not at present regarded as remunerative. The Victoria Planters' Association, one of the most important agricultural associations in the colony, exhibited sugar from sixteen of the principal estates, and fully representative of all the varieties produced. These included what are known commercially as yellow crystals, grocery, concrete, cut lump and first white; with syrups of different kinds. Speaking in general terms, the quality was excellent, but only comparatively. It was excellent as a South African product, but the varieties, it is to be feared, would lose by comparison with similar ones from older sugar-producing countries. In the opinion of the judges, few of the white crystallized samples were worthy of any special commendation.

There are at present about sixty sugar mills in Natal. The extent of land under cultivation is about 25,000 acres,

the average yield per acre being about 1½ tons. It is estimated that about half-a-million pounds of capital is employed in the industry. The labourers are mostly Indian coolies, imported and indentured for a number of years.

The cultivation and preparation of tea in Natal is an industry of recent growth. It has been long known that the shrub thrives in the colony as it will in most parts of South Africa. A few years ago Mr. Hulett, M.L.C., entered earnestly into the work of making tea an exportable article, and has now a considerable acreage under cultivation on the coast. Mr. Brickhill and Mr. W. B. Lyle have also been engaged in a similar pursuit. The outcome of the efforts of these three gentlemen were exhibits of tea giving great promise for the future of the industry. Mr. Hulett's varieties consisted of Pekoes, Fine Souchong, Golden Pekoe and Pekoe Souchong; Mr. Lyle's of Pekoe teas; and Mr. Brickhill's of Natal Assam tea, China tea and mixed tea. All these producers seem to have met with gratifying success, the different varieties being commendable. Just one step more in the final preparation of the article and it will reach the level of the best Indian and Chinese importations. It may take time to popularize it in Europe, but a meritorious article usually finds its right standard of appreciation. For the present there should be sufficient demand in these colonies to absorb the whole of the crops for many years.

Coffee is another Natalian product whose history has been chequered. At one time much was expected from it, but a variety of diverse influences have retarded its successful cultivation. The single exhibit in this court was made by Messrs. R. Acutt & Sons, Durban, who showed the bean in its unroasted state. The sample did not strike one as possessing any special excellence.

Messrs. Jameson & Co, Durban, sent a large variety of their jams and jellies, curry powder, cocoanut preparation, celery, salt, cayenne pepper, chutnies, lemon syrup and other colonial preparations. It would be difficult to find terms of praise too high for the jams. They compare most favourably with the best produced in Europe. If the prices are in fair competition, the ordinary imported jam, which is too frequently a deceptive concoction, should soon become a thing of the past in the adjoining colony. The cayenne pepper and other preparations from colonial products deserve encouragement.

Mr. E. Essery exhibited quantities of his excellent Riet Valley tobacco, cut and in leaf. Messrs. Acutt exhibited

some Potchefstroom tobacco, manufactured by Mr. Reid of that place.

A somewhat remarkable feature connected with this court was the number of sampl's of gold quartz and ore from the Transvaal. Mr. G. Hillary had on exhibit gold from no less than fourteen of the principal reefs; Messrs. Grice & Co. samples of auriferous quartz from eighteen reefs; while Mr. Goodricke showed copper and iron ore, coal, anthracite, yellow ochre and purple oxide of iron from different parts of Natal. A number of photographs of the different reefs lent interest to those collections. The Natal Government sent samples of coal from Newcastle—the main coal district of the Colony; the Natal Chamber of Commerce sent samples of lead and silver ore and fossil wood; and the Middleton Reef Company a sample of gold quartz.

Mr. A. Lyle, Pietermaritzburg, exhibited some deservedly noticeable shoe and harness leather, all tanned in that city with the bark of the wattle.

The only sample of Natal rum was exhibited in a single bottle by Mr. F. L. Jonnson, Royal Hotel, Durban; it was ten years old. Experts state that if kept for a period of from eight to twelve years this liquor, which, when new, is a vile concoction unfit for Europen requirements, becomes equal to the best rum produced in any part of the world.

The Natal Chamber of Commerce exhibited a case of Natal arrowroot, of the very best quality and excellent in appearance. This product has been grown in Natal for a long period, but the demand for it is too limited to justify its becoming an important article of export.

The other Natal exhibits included mottled soap, by Mr. R. Louth, Durban; interesting samples of Fourcroya fibre, by Mr. Blamey, Milkwood Kraal; peach, guava and orange wines, by Mrs. Pay, Durban; paints, by Mr. C. Wakelin, Durban; a work-box of 7,190 pieces of Natal wood, by Mr. J. F. Hutchinson, Durban, which received high praise from the judges; specimens of Umzimkulu lime, marble, Natal specifics, raw silk, &c.

THE NATIVE EXHIBITS.

To many visitors one of the most interesting features of the Exhibition were the exhibits by the natives of this colony. The progress made in civilizing and utilizing the native will ever possess concern to the careful observer and the genuine lover of colonial progress. The masses of colonists may

remain sceptical on the broad subject and main issue of what is usually known as missionary work, and no doubt many of the popular objections to it have some foundation in actual appearance. Still, situated as we are, it will be very unwise indeed to permit race distinctions to have too strong an influence. The natives are in the country, and are year by year coming into closer contact with European influences. In the natural order of things they must change their condition, and Exhibitions of this nature mark the progress they make in industrial pursuits.

The stand occupied by the exhibits of the Moravian Mission School at Genadendal, Caledon, the oldest station of the kind in South Africa, deservedly attracted close attention. The bent cane and wood manufactures, flower stands, &c., by the older pupils of the Institution were capital. The Kindergarten objects in plaiting and sewing by native children, five to seven years old, were also most creditable. The specimens of sewing, knitting, hooking, &c., by the native girls were very good; some of the work was of a high-class character.

From St. Luke's Industrial School, Newlands, East London, some creditable work was exhibited, consisting of church and house furniture, and ends of book shelves in fretwork. These exhibits tend to show that at these Industrial Schools good, useful work is quietly proceeding, and that the teachers are labouring persistently in elevating the natives.

More interesting still was the stand of the Kafir Training Institution, Graham's Town, where work in black stinkwood, yellowwood suite, mediæval suite in ash, with alder panel work, formed attractive objects. Made entirely from colonial woods from the Knysna forests, they exhibited in a marked degree the mechanical capability of the native under European supervision and the suitability of colonial woods for house furniture.

The girls of the Emgwali Mission School exhibited tastefully-executed and well-made garments, including ladies' and gentlemen's underclothing, aprons, jackets, pinafores, crochet work, &c.

Most interesting of all, though, were the exhibits from Lovedale, the most extensive, best known and probably most successful Native Industrial Institution in South Africa. From this Institution there were no less than 122 exhibits, including over 400 articles, so that the fullest opportunity was presented of accurately estimating the range of effort of which the native is capable. The col-

lection was composed mainly of house and school furniture, wagon work, turned articles, smiths' work, printing and bookbinding, by the men and youths; and needlework and useful fancy work by the girls. As exhibited, the articles were satisfactory in the highest degree, and must have offered much encouragement to those who have the future of the native races deeply at heart. When it is stated that the work in the carpenters' department included such articles as cheffoniers in pitch pine and yellowwood, a splendid bookcase in stinkwood, a set of drawers in chestnut, picture frames in teak, school desks, &c., in yellowwood and pitch pine, all creditably executed, it may be inferred that the efforts of the natives have been ambitious ones. The turned work was mostly excellent, and included articles in white and red pear, assegai and yellowwood. Similar remarks apply to the wagonmaking department, the articles on exhibit consisting of wagon and other wheels in assegai, white and red pear, stinkwood, ironwood, yellowwood, &c. In the blacksmiths' department they showed the arms for the foretongue of transport wagon, stays of after guide, buck irons, side hooks, &c., and garden rakes, screw wrenches, &c. The whole of these pieces evidenced careful if somewhat primitive workmanship, and furnished convincing proof of the capacity of the native for useful work of this nature. It may be here stated, however, that it is not pretended that native workmen left to themselves would produce articles of the same quality, exactness of measurement, care and finish as these exhibits displayed. The articles were made under European superintendence and showed that the work can be done if the natives choose to exert themselves. Dr. Stewart disclaims responsibility for the use they may make of the instruction afterwards. It must be left to the native workmen whether such knowledge shall be fully utilized or not. At many of the mission stations and other places in Natal and the Transvaal great progress has been made by native youths in carpenters and blacksmiths' work, but the almost invariable result has been that when the apprenticeship expired or the natives left the station no further use was made of the knowledge gained. The printing and bookbinding exhibits compared very favourably with the work turned out by most of the smaller printing offices in the colony, and showed that the native is capable of being educated in industries requiring more than the average amount of technical skill.

From the girls' industrial department there were specimens of needlework in great variety. The taste displayed showed

that native girls have more of the artistic in their organization than they are usually credited with. The articles on exhibit included boys' suits, girls' garments, aprons, white and coloured shirts, vests, &c. As showing the progress made in African civilization, the dress of the Zambesi native, the Kafir red blanket and shirt, were placed side by side with the dresses made by and worn by the native teachers at the institution.

A model in wood of the new educational buildings, by Mrs. Stewart, some plans of the same building, photographs of the surroundings, &c., formed fitting accompaniments to the other exhibits.

From the Healdtown Mission Institution there were some interesting and carefully completed work in knitting, sewing, crochet and trimming. Some baskets, mats, pipes, &c, made up a creditable collection

These native industrial exhibits would have been still more interesting and instructive had they included work from the principal stations in the Transvaal, Natal and Basutoland. It is well known that for many years the work of civilizing, and it is to be hoped Christianizing, has been steadily proceeding in all these countries, and to some extent also in Zululand. With some of the Natal natives extraordinary progress has been made. Possibly the present generation may witness an interesting Exhibition composed entirely of exhibits by the natives of South Africa. The progress of native races from a changeable pastoral to a fixed agricultural state is usually much slower than the further progress to a manufacturing state.

In this department Mr. Andrew Smith, M.A., made an interesting contribution to South African materia medica from plants in use amongst the natives. It has long been known that the natives throughout the country have remedies of their own which they frequently use with great efficacy, and that they possess a knowledge of medicines some of which are of a potent nature. Hitherto the difficulty of obtaining from them such information as would enable one to carefully examine and experiment with these remedies has prevented any definite results being obtainable. No doubt in course of time further progress will be made in this direction from a scientific basis. It seems very probable, as Mr. Smith points out, that most of the knowledge of medicinal plants possessed by the Dutch colonists may be traced remotely to the Hottentots in the Western Province and to the Kafirs in the Eastern. Amongst the Zulus and the Natal Kafirs the knowledge of diseases and plant

remedies has reached a remarkable place, considering they are in other respects so low in the scale of civilization. Some of the native remedies are well known to the masses of Kafirs; others, and amongst them some powerful poisons and their antidotes, are only known to a few, who keep the knowledge to themselves with profound secrecy and hand it down from father and son. Mr. Smith endeavours to show how the virtues of the 12,000 different South African plants became known to the native herb-doctors, and says in his well-written book, "It is contrary to all analogy to suppose that the country does not produce plants which are antidotes for its diseases, especially with such an extensive flora." In enumerating the plants used as antidotes for snake bites, he says the colonists may rely that the wild dagga is the one noted South African plant used for this purpose, and recommends that it should be put to the test by experimenting on dogs and other animals when bitten. There is much that would well repay careful research regarding these native remedies. If the effect was only to remove the mystery surrounding some of the remarkable cases coming under the notice of many colonists, a valuable result would be obtained. In Europe medicinal herbs are in increasing demand as the local supplies are becoming exhausted, and ours may possibly become a valuable article of export. No doubt many South African plants might prove of considerable value for pharmaceutical purposes if their properties were thoroughly investigated.

No South African Exhibition could have been deemed complete without a representation of what has become known as native curios. The phrase is somewhat misleading, though, to strangers, as the "curios" embrace all the articles and utensils, domestic and general, used by the native in his natural state. They are deeply interesting to the student of native character and tradition, and furnish the observer with the means of estimating the past and present condition of the natives of South Africa. The weapons of war and articles of necessity and luxury of any race of people furnish a fairly reliable index of their material condition.

The principal exhibitor was Mr. Snooke, of Queen's Town, whose collection included over 750 articles. Many of them were similar, but still the varieties were numerous. To enumerate the principal ones only would be to compile a good-sized catalogue. They were typical of the condition of the native when on the war-path, at home in his domestic state, following the chase, &c. The design and workmanship would seem to furnish evidence that in his

normal state, away from civilizing influences, the native makes but little progress. Pipes, baskets, assegais, kerries, shields and other weapons and utensils are the same in style and workmanship as those used by his progenitors a couple of centuries ago. It is not until he comes into contact with European civilization that the native shows any distinctly progressive instincts. Had there been no white colonization on this continent there would have been no native progress.

These exhibits of primitive effort placed side by side with skilfully and artistically finished articles from Lovedale and other Native Industrial Institutions furnished an interesting picture of the progress made in a couple of generations of native training. At the Home Exhibition the exhibits of this nature will no doubt attract close scrutiny.

Mr. B. Lagerwall, Port Elizabeth, had a well-arranged stand of native curios, stuffed heads, horns, &c.

One of the most interesting exhibits in this section was a model of a native village by Mrs. Stewart, of Lovedale. In a very clever fashion the general formation and principal details of a native village struggling with civilization, with its huts and ordinary surroundings, were exhibited.

The Lovedale natives sent very little illustrative of the native in his savage state. Some pots and human bones from Basutoland marked the period, comparatively recent, when cannibalism was common amongst some of the South African natives. The custom is said to exist amongst some tribes in Natal and in what was recently known as Sekukuni's country, but is now rarely heard of.

Mr. Lange exhibited a model of a Kafir hut with some native figures, the design and workmanship of which were very creditable. Another exhibitor had a couple of Kafir dolls, which furnished an interesting novelty.

Mr. J. L. Fry, Kimberley, sent down a valuable collection of native arms, utensils, &c., used by the natives of the countries adjacent the Zambezi. They are somewhat different in construction to those in use in this colony, but not materially.

THE TRANSVAAL AND THE FREE STATE.

Neither the Transvaal nor the Free State contributed materially to the success of the Exhibition; practically it was confined to the Cape Colony and Natal. It seems a matter for some regret there was such a paucity of exhibits from these Republics. They represent, territorially, an

important part of South Africa, and are closely connected commercially with the adjoining British States. Anything showing their present pastoral and agricultural condition, or illustrating more clearly their natural resources, would have been interesting. The Free State produces wool, skins, hides, feathers and cereals of quality similar to the products of this Colony. The Transvaal has magnificent agricultural and pastoral resources, and in some parts furnishes important products. The only exhibits from this Republic were mineral specimens, referred to elsewhere. The new British colony of Bechuanaland was also unrepresented at the Exhibition.

MESSRS. SAVAGE AND HILL'S EXHIBITS.

The splendid collection of exhibits by Messrs. Savage & Hill formed one of the most instructive and pleasing features of the Exhibition. Under other headings we have already referred in detail to the principal articles, and want of space forbids enlarging upon the subject. Merely to enumerate the various articles would fill a good-sized catalogue. Messrs. Savage & Hill must have been extremely gratified at the evident appreciation of their magnificent collection by all visitors.

CLASS V.

THE FINE ARTS.

Comprising over five hundred separate exhibits, the collection under this head was the largest, most varied and altogether probably the best ever exposed to public view in South Africa. It occupied considerably over 2,500 feet of space on the walls of the gallery of the main hall—the best position that could have been secured in the buildings. Nothing was lacking in the way of effective display.

To visitors unacquainted with the technicalities of Art, as generally defined, but still possessed of an inherent love of the beautiful and artistic, the collection offered a continuous treat; while to students, and those more or less acquainted with the principles of Art, it furnished a rare opportunity of observation, instruction and comparison.

The exhibits were from all parts of this colony and Natal; the older centres, where, from the more settled conditions of life, Art has contrived to secure a permanent home, contributing most extensively.

The section included paintings in oil; water colour drawings; architectural and mechanical drawings; photographs;

decorative work; pen, pencil and chalk drawings; paintings and drawings on wood, ivory, shells, &c., &c.

A number of paintings lent to the Exhibition by the Colonial Government added greatly to the interest of the collection. These included oil paintings, by the late Mr. Thomas Baines, illustrative of an interesting period in the history of the Eastern Province; paintings illustrative of frontier and native life, by the late Mr. Bowler and Mr. I'Ons, Graham's Town; vigorous and striking paintings of Table Mountain, ostrich farms, &c., by Mr. Rolando, Cape Town; bullocks, by Mr. McCallum; Knysna Forest and Sea Point, by Mr. Herman, &c.

In the oil paintings and water colours the subjects were nearly all colonial, and, as a consequence, apart from their merits as Art studies, the pictures were interesting to a wide circle of visitors. Fruit and flowers seem to have been specially favourite studies, and embraced nearly one-third of the oil paintings. The cynical critic, from this fact, might be disposed to assume South African Art has not soared much higher than dessert and vegetables, but it must be remembered that the course and progress of Art is always influenced by its immediate surroundings, and that it is often pursued in South Africa under great difficulties. It seems somewhat doubtful, though, whether an ultimately good result will be attained by the lavish issue of certificates of honourable mention to very amateurish pictures of peaches, plums, pineapples, and the common floral objects of the country.

Few subjects, however, are so surrounded with prejudices as that of painting, and to engage in any detailed criticism would be an undesirable, unprofitable, and, for the present purpose, unnecessary task. The real fact is, as Mr. Ruskin points out, "it is easy to criticize; it is Art that is difficult."

Regarding all these pictures—landscapes, seascapes, river scenes, portraits, fruits, flowers, birds, buildings, animals, &c.—as representative of the present condition of South African Art, it is gratifying to observe a distinct and decided advance upon every former Exhibition of the kind. It is clearly evident that the standard reached is much higher than that of a decade or even half-a-dozen years ago.

The judges awarded a silver medal to a vigorous painting of Mr. A. de Smidt, Cape Town, and accorded honourable mention to Cape Flats, Blarney Castle, Wynberg Hill, and wild flowers, by Mr. H. Fletcher, Cape Town; flowers, by Miss Margaret White, Graham's Town; Protea, peaches, grapes and tomatoes, by Mr. James Ford, Cape Town.

Honourable mention was also accorded to Miss Kirkwood

and Miss Dyason, Port Elizabeth, for some most creditable flower painting on panels.

In water colour drawings the gems were some exquisitely finished flowers and Cape fishes by Miss Thwaites, Cape Town, which obtained the silver medal and were recommended by the judges as suitable to send to the Indian and Colonial Exhibition. Mrs. Allen was awarded a special silver medal for some charming sketches of scenes in Natal. Honourable mention was made of The Valley (Port Elizabeth) by Mr. H. C. Leslie; River Mouth, by Mr. Fleming, Mossel Bay; and views on the Umzimkulu, by Mrs. Allen.

The exhibits from the Colonial Schools of Art were very numerous, comprising 77 from Cape Town, 38 from Graham's Town and 73 from Port Elizabeth. Free-hand drawings were the principal efforts, and a very creditable display they made; oil and water colours, sepia and cast models, machine drawings, examples of building construction, &c., also served to show artistic work of a very promising nature. These exhibits furnished an excellent opportunity of comparison of the different schools, as well as the progress being made at these important colonial institutions. There seemed too great an abundance of elementary studies in chalk and pencil and too many copies, but probably the latter condition was unavoidable.

The exhibits of architectural drawings were numerous and good. Mr. A. H. Reid, Port Elizabeth, was awarded a silver medal for a series of six splendidly-executed drawings. Honourable mention was made of some well-finished drawings by Mr. S. Stent, Kimberley, and Mr. L. Canning, Bloemfontein. The other drawings in this class were very creditable.

The photographic exhibits were extensive, varied and thoroughly good, and were sufficient to convince that in this branch South Africa has steadily kept pace with the times. They served to show the surprising strides in this art during the last decade, and to point out to what varied uses it may now be applied.

The portraits by Messrs. R. Harris, Port Elizabeth, B. Kisch, Durban, and Mr. Barnard, Cape Town, were remarkable for fidelity to detail, natural and easy pose and excellent and artistic finish. Mr. Harris' enlargements, panoramic scenery and instantaneous studies were particularly good specimens of the respective classes of work.

Mr. Roe, Graaff-Reinet, had some striking and splendidly-executed landscapes, and Mr. Battenhausen, Port Elizabeth, some good and beautifully finished portraits and enlargements.

BOOKS, PUBLICATIONS, ETC.

The exhibition of South African publications, while far from complete, was interesting as throwing additional light upon some phases of colonial history. Mr. Walter Searle exhibited copies of old Cape Town newspapers, dating from the beginning of the century, and including a copy of the *Cape Government Gazette* containing an account of the victory of Waterloo in 1815. Copies of the earliest Free State newspapers were shown by Messrs. Barlow Bros., Bloemfontein; and a copy of one of the earliest Transvaal organs by Mr. Celliers, Pretoria. Copies of the earlier numbers of the *Natal Government Gazette* and of other well-known papers were included in what was manifestly a very incomplete list. Some portraits of Cape Governors and illustrations of events in Cape history, lent by Mr. C. A. Fairbridge, were also shown; also copies of a recently-written history of the Free State by Mr. M. J. Boon. A complete collection of the principal books on South Africa would have been very interesting. Some South African school primers by Mr. A. Wilmot, Port Elizabeth, which are favourably known throughout the colony, were shown at the stand of the British and Foreign Bible Society. Maps and charts of the comparative rainfall, and some books exhibited by Mr. J. W. Mackay, Port Elizabeth, lent additional interest to the collection.

LACES, FANCY WORK, ETC.

This section attracted some most creditable and promising exhibits, and indicated the existence of patient effort and artistic taste. The pursuit is one admirably suited to ladies, and furnishes opportunities for the display of much skill and taste.

The forty-four exhibits from the Convent of the Sacred Heart, King William's Town, included specimens of a high order of merit. They probably lost something in effect from a lack of full display, the glass case in which they were shown being too limited in its dimensions. This remark applies to some of the other exhibits of fancy work, but it was an unavoidable condition. Some vestments were works of high art; the lace work, crewel work, embroidery, hair work, &c., were beautifully executed, while the hand-painted articles were deserving of high commendation. The judges considered some raised gold worked in white silk the finest of the kind in the Exhibition.

The sixty-five exhibits from the Convent of the Holy Rosary, Port Elizabeth, were of a similar kind, and were also highly meritorious. Lace and crewel work and hand-painting on different objects were most creditable.

Mrs Bevan, Uitenhage, exhibited some artistic and beautiful work in shells, sea weeds, flowers, leaves, seeds, &c. The collection was most effectively and tastefully displayed, and evidenced much patient effort and skill.

Miss Considine, Port Elizabeth, secured a bronze medal for the best exhibit of coloured wax-flowers.

Mrs. Saunders, Port Elizabeth, was in attendance and showed the mode of making Honiton lace.

PERFUMERY, OILS, TOILET NECESSARIES, SPECIFICS, ETC.

Until recently the manufacture of these articles in South Africa has presented so many difficulties that little progress has been made in what must ultimately eventuate in extensive and to some extent important industries. Although to some extent luxuries, perfumeries and toilet necessaries are in general demand and will be increasingly so as education and higher intelligence become more widely diffused.

Messrs. Lennon & Co., of Port Elizabeth, were awarded the silver medal for the variety, excellence and cheapness of their articles, which included such colonial-made perfumes as eau-de-Cologne, lavender water, Florida water, ess-bouquet, jockey-club, omar-essence, &c., and different kinds of dentifrices. The judges characterized these perfumes as being of very fair quality and quite equal to many importations, and considered the spirited enterprise of the firm to compete with foreign perfumery as deserving of the highest encomiums.

Mr. H. C. Bell, of Graham's Town, exhibited over fifty preparations made by himself, comprising dentifrices, perfumes, hair washes, &c.

Both these exhibitors are deserving of great credit for the elegant way in which their preparations were put up and for the attractive arrangements of their stands.

Messrs. J. & C. Hedding, of King William's Town, exhibited ultramarine blue, blacking and anti-corrosive paints of colonial manufacture, which deserved creditable mention.

Mr. J. M. Leslie, of Port Elizabeth, showed a large assortment of proprietary preparations. These included

toilet necessaries, household requisites, medicinal specialities and a field medicine chest.

The manufacture of the above and similar articles should meet with encouragement in the colonies.

At the stand of Mr. L. Parent, of Cape Town, there was the largest collection of indigenous herbs ever exhibited in South Africa These were shown in connection with certain proprietary medicines of the Exhibition. The efficacy of the articles could not well be tested on this occasion. Probably the stand failed to attract the attention due to it from the lack of explanation on the spot, and want of classification was another great drawback.

Mr. Jesse Shaw, of Fort Beaufort, exhibited a number of specifics for colonial accidents and ailments; it is impossible to express an opinion on their merits here, but it is within the knowledge of many people that they have an established reputation throughout this Province and in other parts of South Africa. His specific for the cure of snake-bite has been within the knowledge of the writer used with beneficial effect, and obtained the reward offered sometime ago by the Indian Government for such a specific.

CLASS VI.

Miscellaneous Exhibits.

MINERAL AND AERATED WATERS, ETC.

The exhibits in these articles were thoroughly satisfactory, both as regards variety and quality. For many years such aerated waters as are in common demand have been made in all parts of this country of a quality in no degree inferior to the best that can be imported. The water and the climate favour the industry. In some parts of South Africa there are natural mineral waters of high local repute and presumably possessed of many virtues. Their comparative inaccessibility is doubtless one reason why their value has not been more accurately determined.

Mr. H. C. Bell, of Graham's Town, had a splendidly displayed assortment comprising ten kinds of aerated waters, ten kinds of fruit syrups and cordials, six kinds of bitters, including angostura and maag, and six kinds of liqueurs.

The Uitenhage Mineral Waters Company showed many kinds of tastefully prepared aerated waters, including [illegible] and ginger champagne.

Messrs. Leslie & Son and Messrs. White & Morgan, both

of Port Elizabeth, had also some attractive exhibits which were good in quality and fine in appearance.

Messrs. B. G. Lennon & Co., of Port Elizabeth, exhibited preparations in this class from soda, potash, quinine, lemon, &c.

Messrs. Hamlin & Co., of Aliwal North, sent mineral water from the springs there, and Mrs. Pay, of Durban, is deserving of mention for her preparations from peaches, oranges, guavas, &c

An exhibit of the latest machinery for the manufacture of aerated waters would have been highly interesting.

INSECT PESTS.

Mr. Bairstow, secretary to the Port Elizabeth Naturalist Society, exhibited four cases of insects injurious to field crops, fruits, &c. This collection was an important one, and might well have received more attention from farmers. Recent experience leads one to believe that in many cases the failure of a crop may be attributed to a few of these insect pests. In order therefore to furnish opportunities for more careful examination, it might be well if lithographic coloured drawings of these insects were supplied by Government to the different Farmers' Associations in the Colony. With regard to the Phylloxera, just recently reappearing in the Western Province, valuable results have been obtained from lithographs of the pest being properly distributed.

SHEEP DIPS.

There are few subjects of discussion amongst flockmasters regarding which there is such diversity of opinion as that of the best dip for sheep. It is probable that no particular one is specifically the best, and best adapted to all requirements. It is a common experience for dips found satisfactory in one part of the country to be disappointing when used in another. The judges point out that the qualities essential in a really first-class dip are that it shall effectually destroy the *acari*; be uniform in strength and safe in use; and that it shall not injure the wool. The experience of this and other countries shows that no known dips completely fulfil all these important conditions. Hence the necessity of each farmer using what he finds the nearest approach to his requirements. The six exhibits enumerated in the judges' report are all well known in England, America, Australia, South America and in these colonies, and have each secured flattering

testimonials. An opinion, however, prevails among many who have studied the question in this country that the most efficacious and cheapest dip and at the same time the least injurious to the fleece can be made, by farmers themselves, from colonial-grown tobacco, which can, in most cases, be grown upon their own farms.

Among miscellaneous exhibits not included in the general classification, were the following:—Bird cages, exhibited by Mr. W. Sheldrake, of Bedford, and Mr. Mance, of Port Elizabeth; mats, by Mr. J. W. Weir, of King William's Town; a lady's large hat, by Messrs. Muirhead & Gowie, of Graham's Town; ink, by the King William's Town Match Factory; Bushman tea, by Mr. J. I. Edwards, of Bedford; buchu leaves, by Mr. W. Leinberger, of Port Elizabeth; Bushman grass and sheepskin mats, by the Hon. J. X. Merriman; chemical preparations, by Messrs. Calvert & Co., Manchester; Milner's safes, by Mr. W. Hume, of Port Elizabeth; a level and a milestone, by Mr. W. Girven, of Port Elizabeth; boro-glyceride, a food preserver, by Mr. W. Waller, of Graham's Town; materials and appliances used in dentistry, by Messrs. Elstob, of Durban, Mr. Kolsch, Cape Town, and Dr. Stroud, Port Elizabeth; the Port Elizabeth life boat and rocket life-saving apparatus, exhibited through the courtesy of Capt. Skead, Port Captain, and Major Deare.

THE HOME EXHIBITION.

Hitherto the reputation and standing in Europe of these colonies have not been what the real lover of colonial progress desires. This vast, somewhat disjointed and unfortunately somewhat disunited portion of the British Empire, which upon the maps of the world bears the cognomen of South Africa, has for a long period seemed to be forgotten or neglected by the dwellers in the crowded countries of the Old World. Wonderful diamond and gold discoveries, Zulu, Boer or Kafir wars, or the annexation of a new slip of territory, may for a time have created a passing interest, but by the great mass of the English-speaking race we have practically been neglected and forgotten. A few people interested in these colonies have of course been aware that ships come and go, that people are born and die the same as in every other part of this sublunary sphere, but we have never succeeded in being thoroughly understood.

Able pens and eloquent tongues have at times laboured earnestly to secure for the South African colonies a better and fairer recognition, but it is to be feared that their desires have failed of the full measure of realization. An Exposition, such as opens in London in May next, is calculated to do more for us than most of the previous efforts and endeavours. It is to be a great and grand show of the products and manufactures of the British dependencies. It will be a representative collection of everything denoting the present condition and the future promises of the colonies. Hence our opportunity. At former Exhibitions in Europe, South Africa has not appeared to the advantage that her friends could desire. It is needless to recapitulate the causes. How and to what extent our commerce has suffered in consequence is best known to those who have substantial interest in South African exports. This Exhibition, although it has achieved its main object here, acts only as a prelude to the thoroughly vital and important Exposition in England. Having shown the inhabitants of South Africa what they may do for their own requirements by well-directed efforts, the South African portion of the Home Exhibition will be of inestimable value in indicating our capabilities and in furnishing convincing proof that this colony really is prepared to take its stand in manufacture and production side by side with the other countries of the world. It will show what we can contribute to the commercial wealth of the Empire and the world, and if the demonstration is not quite so complete as could be desired, it is certainly a distinct and decided advance upon every previous effort in this direction. The colonies will be on their trial. The shrewdest and wealthiest merchants in the world will be the critics, and if any article attracts their attention, their enterprise is pushing enough to guarantee a flourishing demand for the raw material selected. whe Cape has never before had such an opportunity, and Till strain every nerve to secure a thorough exhibit of its products. For the first time there will be the various products of all portions of the British Empire brought together under one roof, in the great metropolis of the United Kingdom, in the greatest port of the greatest commercial nation of the world, and in the greatest capital of the greatest Empire the world has ever seen.

II.

THE FINE ARTS.

By A. de Smidt, *Surveyor-General of the Colony, Cape Town.*

In the brief remarks on the Fine Arts which it is my purpose to offer for the consideration of an association of gentlemen, whose aim should be the development, not only of the material resources of this country, but of all that tends to elevate and to refine, I trust it is not expected of me to enter into the mere manipulation of the means and materials of Art, to dilate on brushes and colours, oils and varnishes, or on the sculptor's mallet and chisel. This is better learned by watching a painter at his work, an architect elaborating his design, or a sculptor giving form and substance to a noble conception, from the stage of the clay model to its full realization in enduring marble. I shall endeavour to show that the purpose of Art is not, by mere exact imitation, to display all the actual and visible characteristics and properties of the objects which Nature presents to the eye; but that both judgment and feeling combine in the practice of Art. I trust to succeed in making it apparent to you that to understand the principles on which artistic representation depends calls into play no new faculty. The path to excellence is open to all who will diligently and reverently pursue it. There is no royal road, no secret that the rich can purchase, and the poor must sigh to attain. There are persons who appear to think that works of Art are the outcome of some exceptional and peculiar gift, and who will not believe that fair success may be attained in the proportion of general fitness for other intellectual pursuits, and, provided the study be conducted on right principles, that nothing is denied to diligent and well-directed labour. On the other hand, nothing can be attained without serious application and study, by which the judgment is informed, and the efforts of the hand directed.

If painting were no more than an innocent amusement (which is all the good that some people can say of it) it ought to be ranked among those blessings which we mortals possess as a pleasant ingredient in human life. But it is much more than that, in being the means by which we convey ideas in unmistakeable language, completing the whole art of communicating our thoughts to others. If we regard the end of Art as a representation, according

to established principles of truth and beauty, of every object discernible by the eye, and every emotion of the mind, who is there that will question its high mission, its refining and civilizing influence, and that it possesses special advantages which are denied to literature? Art speaks directly to the sense with an effect infinitely more rapid, powerful and direct than any other means of communication. Let us but consider in how many languages the productions of genius are written, and how impossible it is for every one to enjoy their beauties or benefit by their lessons; while Art is entirely independent of language, and the truth and beauty of natural forms are as intelligible to the humble labourer as to the educated gentleman. I have seen in the Royal Gallery at Dresden persons affected almost to tears by the sight of Raffaelle's "Madonna di San Sisto" No one can look at Rubens' "Descent from the Cross" in the Cathedral of Antwerp without experiencing a feeling of profound sympathy and devotion. The language which such a picture speaks appeals strongly to persons of all nationalities; and even in the wilds of this dark continent the deeply hidden emotions of the soul would be stirred by beholding this masterpiece of Rubens, or "The Crucifixion of St. Peter" at Cologne, or "The Entombment," in the Louvre, by Titian. Who that has seen Doré's "Christ Leaving the Prætorium" will deny that no written description can convey so clear, so impressive a sense of the deep solemnity and significance of that scene? By the historical paintings of Le Brun, Horace Vernet, Gros and Gerard the great events of French History are communicated to all classes of people far more vividly than could possibly be done by books or lectures.

This power of Art as a medium of education for all conditions of men was recognized by the ancients. Even in this country more light has been cast on the habits and character of the Bushmen by their own rude drawings in caves and on rocks, than by much that has been written about these people. The higher classes, who through wealth and education command the enjoyment of the creations of the greatest writers, can more readily endure the want of the ennobling influences of Art. Language need not be to them a barrier to intellectual enjoyment. They can, at will, refresh the spirit with the verse of Homer, that purest source of all poetry; or with Sophocles elevate it to the utmost height of passion. With Dante they may descend into the awful depths of the Inferno, or enter the marvellous and mysterious world of

Shakspeare. They may revel in the graceful and inexhaustible humour of Cervantes and Le Sage, the profound philosophy of Goethe, or the charm and pathos of Schiller. The wit of Voltaire will electrify, and Ariosto, Alfieri and Boccaccio pour out their bounties for his gratification. But the poorer classes are almost entirely shut out from these sources of enjoyment. To them pictures afford a means of instruction and healthy, refining influence not otherwise attainable. The poor may stand beside the rich and gaze with equal rapture at Correggio's "Ecce Homo," Doré's "Dream of Pilate's Wife," or the divine conceptions of Raphael, Murillo or Hunt. To make works of mind accessible to the people has always been found to be a powerful incentive to moral and intellectual improvement. To the mechanic an acquaintance with works of Art is of immense advantage. It makes him a better workman by placing before him examples of the highest excellence; and, what is more important, it furnishes all with a delight independent of position or rank, and calculated to purify the mind and exalt the understanding. "Excellence will not become less excellent by being diffused and the sense of the true, the beautiful and the pure will not become less valuable by being rendered as familiar and indispensable to every sentient being as love, light and air."

In respect of the commercial advantages of the Fine Arts, it should be mentioned that works of sculpture, painting and engraving form a valuable asset in a nation's possessions. No workman produces so valuable a thing from such cheap materials as the painter, for instance, taking the time as a part of those materials also into the account. A nation is enormously the richer for the works of Van Dyck, Rubens, Turner, Millais, Landseer, and a host of other workers with inconsiderable materials. Their works are almost as current coin of the realm in every civilized country, and constitute a marketable commodity the importance of which, as a factor in commerce, may be seen from the immense results of Art sales, both public and private, and the attraction of countless visitors to such capitals as London, Paris, Rome, Vienna, Berlin, Munich, Dresden, &c. The sale of the celebrated Fountaine collection, and of the Blenheim Palace, may be referred to as notable instances of enormous sums paid, and the eagerness with which a large number of persons compete for the acquisition of the beautiful productions of Art. Some years ago I attended a Saturday afternoon sale at the rooms of Messrs. Christie and Manson. The saloon is simply draped

with green baize, a rostrum at one end and a sort of elevated easel for showing the pictures, never more than one at a time, all the others being in an adjoining room and brought in one by one, so that the attention is wholly concentrated on the particular picture on the easel. In a couple of hours works of Art of great beauty, some of them by eminent artists, such as Millais, Turner, David Roberts, Lee, Prout, were knocked down for sums varying from £3,000 to £50, the total amount realized being upwards of £30,000.

The true principles of Art are derived from Nature. That the principle exists in Nature is instantly felt when we call to mind the beautiful appearances of the visible world, and particularly the forms and colours of flowers. The Fine Arts in general may be considered as the human reproduction of this principle. The question of their utility therefore resolves itself into an inquiry as to the intention of the beauties of Nature. A study of the conditions of races in their savage state shows us that in all of them there is an inherent craving for something more than the mere providing for the material necessities of existence. Common objects of daily use are at first simply fashioned in the form deemed most convenient for their especial purpose. After a time the inborn tendency to reproduce the beautiful appearances presented by Nature begins to manifest itself, and decoration or ornament is applied to the embellishment of dwellings, to articles of daily use, to arms, and to the person. This tendency takes even the form in some barbarous races of tattooing on the flesh designs copied from natural objects. Art in its broadest aspect means something more than necessity demands from man in a savage state. The love of ornament, innate in our being, prompts them to apply Nature's ever teeming beauties in the decoration of what stands first in the order of the Fine Arts, viz., Architecture. Insensibly the leaves and flowers surrounding the primitive dwelling are rudely copied in carvings on wood and stone. The climbing tendrils are reproduced, and conventional forms are adopted in the attempt to realize an imitation of the beautiful objects presented by Nature. The closer in his creations man can approach to the principles which are manifested in the appearances of Nature, the higher and purer are the sentiments of delight at the sight of his reverent following in the path of the Creator of the Universe. But mere imitation is not desirable, and we are not to conclude that absolutely exact imitation is the object which artists should set before themselves. The faithful and minute cast of a

human form, for instance, can never equal the impression produced by a good statue, or a relief in marble. Monsieur Taine says that, "if it were true that exact imitation is the supreme aim of Art, what would be the best tragedy, the best comedy, the best drama? It would be a stenographic report of a criminal trial, every word of which is faithfully recorded. It is clear that if we sometimes encounter in it flashes of nature and occasional outbursts of sentiment, these are but veins of pure metal in a mass of worthless dross: it may furnish a writer with materials for his art, but it does not constitute a Work of Art."

Leaving photography as a mechanical process out of the question, I will select a work by an artist noted for scrupulous attention to minute detail. In the Louvre there is a well-known picture by Balthazar Denner, at which he is said to have worked for four years. One lingers in astonishment before this marvel of imitative Art. It is evidently the portrait of a woman of about sixty, the size of life. The head is draped with a white veil, over which is a covering of blue silk. No detail is spared, the finest lines and wrinkles, the faintly mottled surface of the cheeks, the black specks scattered over the nose, the bluish flush of imperceptible veins meandering under the skin, and even the reflection of objects in the pupils of the eyes, all these are portrayed with microscopic faithfulness. The illusion is so complete that persons have been seen to touch the picture to verify if it is really a plane surface. The head seems to project out of the frame. Such accuracy, such patience are unparalleled. But we are not moved by it. A bold sweep of Veronese's brush, or a broad sketch by Van Dyck, is far to be preferred.

If further proof were needed I may point to sculpture, which conveys impressions of truth and beauty, though the marble has not the colour of life, and though the eyes are a vacant surface without pupils. An etching, a monochrome sketch in Indian ink or sepia, delights the eye frequently in no less a degree than an elaborately coloured painting.

The student, however, should begin by close imitation, and not give the reins to fancy until he has acquired the discipline of eye and hand which only laborious culture can give. On this essential part of artistic education let us hear what Ruskin says:—"From young artists nothing ought to be tolerated but simple *bona fide* imitation of Nature. They have no business to ape the execution of Masters. * * * We do not want their crude ideas of composition, their unformed conceptions of the beautiful,

their unsystematized experiments upon the sublime. We scorn their velocity, for it is without direction; we reject their decision, for it is without grounds; we reprobate their choice, for it is without comparison. Their duty is neither to choose, nor compose, nor imagine, nor experimentalize, but to be humble and earnest in following the steps of Nature, and tracing the finger of God. Let their work be full of failures, for these are the signs of effort. * * * Let them go to Nature in all singleness of heart, and walk with her laboriously and trustingly, having no other thought but how best to penetrate her meaning, and to remember her instruction, rejecting nothing, selecting nothing, and scorning nothing, believing all things to be right and good, and rejoicing always in the truth. Then, when their memories are stored, and their imaginations fed, and their hands firm, let them take up the scarlet and the gold, and give the reins to their fancy. We will follow them wherever they choose to lead, they are then our masters and are fit to be so. They have placed themselves above our criticism, and we will listen to their teaching in faith and humility, but not unless they themselves have bowed in the same submission to a higher Authority and Master."

An essential feature of a good artistic education is a study of the living model, the lines of which cannot be surpassed for grace and beauty. The Greek school recognized the importance of this principle, as may still be seen in the beautiful works that have been preserved to us in collections like those of the Vatican, the Capitoline Museum, the Louvre, the Uffizzi in Florence, the British Museum and elsewhere. The moment men departed from the teaching of Nature, Art declined. In early times artists had facilities for the study of the human form. Men wore their garments loose, and cast them off easily, frequented the public baths, exercised in a state of nudity. Their sculptors and painters, surrounded by nude and half-nude forms, had facilities for producing them in stone and fresco. Accordingly may be seen on the walls of Pompeii, in the small oratories and courts, beautiful dancing females, manly supple young heroes, with graceful form and attitude, agile in movement, represented with an ease and accuracy which are the envy and the admiration of modern artists. The lines of the human form may even be adapted to the composition of an ideal landscape. The late Mr. Harding has, in one of his works, shown comparisons of the curves of the human form with the outlines of mountains, and the stems of trees; and shows how, by

the study of the best models of ancient and modern sculpture, the artist can beautify his own conception of the forms of things. From this model he derives the power to refine whatever he delineates, and learns to reject that which is mean and commonplace for that which is rare, purified and beautiful. He who is best acquainted with the beauties of the human form, the most perfect of God's works, will have an eye more keenly observant of all other beautiful objects in Nature, of all the properties of form, symmetry, proportion and variety. He will be more apt in judging the merits of architecture, paintings and sculpture; and I am justified in saying that he who has not laid the foundation of his study in the human figure hopes against hope to become a great artist. Mr. Harding gives an instructive example of the adaptation of the outline of Thorwaldsen's "Venus" to the representation of a tree stem; another figure suggests mountain forms of great variety and beauty. In both these instances it is impossible to deny that the composition is beautiful, unless we at the same time deny the beauty of the human form in its perfect development as pourtrayed by the best ancient and modern sculptors.

In the production of a work of Art (a painting, for instance—confining our attention for the present to this branch of Art) certain conditions and qualities are essential to the perfection of the subject—the principal being *Invention, Expression, Composition* and *Colour*. It is not, however, my intention, to enter into details of these essentials in the art of painting, and I can only take a rapid glance at the main features of each of them. Let us suppose that an historical subject is the theme chosen by the artist. The first thing he will have to do is to make himself thoroughly acquainted with the story he means to tell. It will be impossible for him to place more on his canvas than the occurrences in a given instant of time. Some of the early painters, in attempting to convey several episodes of a main event in one representation, have descended to the grotesque. History is not to be caricatured or turned into fable and romance. Every one of the personages should be made to sustain his proper character; and the circumstances and habits of the time have to be closely kept in view in representing the incidents. The scene of action, the local surroundings, require careful attention. There should be one chief action, others happening at the same moment being kept in due subordination. Thus, in Raphael's "Transfiguration," the incident

of the father bringing his son to be cured divides the picture, and diverts the attention of the spectator from the main event of Christ's Transfiguration. The disciples are evidently unwilling or unable to cast out the devil, and the whole action in the episode represented in the lower part of the picture, is out of keeping, and ought to have formed a separate composition.

Titian, also, has attempted to bring into his picture of "The Prodigal Son" all the incidents of the parable, extending over considerable intervals of time. In Raphael's cartoon of "The Death of Ananias" the principal of unity of time is finely observed. Though the death of Sapphira happened immediately after, he does not represent or even suggest this incident; but centres the attention on the chief event. Trivial incidents, though belonging to the event, should not be noticed. Thus in the cartoon referred to, the money, which a moment before had been laid at the feet of the Apostles, is not shown, as not being absolutely necessary to the composition. A painter's language is his pencil; he should neither say too little, nor too much, but go directly to the point, and tell his story with simplicity, clearness and effect. As in a play, there must not be too many figures to crowd the composition. This is beautifully observed in Doré's famous picture of "Christ Leaving the Prætorium" The arrangement of the light by gradation from depth of shadow throws the chief figure into prominence. The eye may successively travel over the minor parts; the soldier going down the steps in front of Jesus, and foreshortened with amazing skill, though claiming attention, does so only for an instant. We are constrained to look at every incident, every detail, but the lines of the composition, the direction of the look of the various figures, and above all the almost dazzling light cast on the chief personage, infallibly withdraw the eye from everything else, to rest with profound sympathy and reverence on the descending figure of our Saviour. Sometimes a great painter permits himself to give the rein to his imagination, and substitutes, for what really occurred, a symbolical represention of the event. So in Raphael's cartoon, "The Charge to Peter," admirable for drawing, expression, and light and shade, the real occurrence is made subservient to the deliberate intention of inculcating the doctrine of the Petric Supremacy. This picture is in the strictest sense of the word a composition, a cold arrangement of propriety and agreeableness according to academical formulas, the painter not choosing to conceive the event as it really must

have happened, but only to secure graceful lines and classical countenances.

Ruskin's caustic criticism of this cartoon is a favourite bit with the detractors of Raphael, a class of critics to which I would not for a moment be considered to belong.

But let us hear what Ruskin says :—" I suppose there is no event in the whole life of Christ to which, in hours of doubt and fear, men turn with more anxious thirst to know the close facts of it, or with more earnest and passionate dwelling upon every syllable of its recorded narrative, than Christ's showing Himself to his disciples at the lake of Galilee. There is something preëminently open, natural, full fronting disbelief in this manifestation. The others, recorded after the resurrection, were sudden, phantom-like, occurring to men in profound sorrow and wearied agitation of heart, and not, it might seem, safe judges of what they saw. But the agitation was now over. They had gone back to their daily work, thinking still their business lay *netwards*, unmeshed from the literal rope and drag. Simon Peter says, " I go a fishing." They say to him, " We also go with thee." That night they caught nothing; but, when the morning came, in the clear light of it behold a figure stood on the shore. They were thinking only of their fruitless hauls; they had no guess who it was It asked them simply if they had caught anything. They said, No. And it tells them to cast yet again. And John shades his eyes from the morning sun, with his hand, to look who it is, and though the glinting of the sea dazzles him, he makes out who it is at last, and poor Simon tightens his fisher's coat about him, and dashes in over the nets. The others get to the beach in time, and sit down face to face with Jesus, and eat their broiled fish. And then, to Peter, all dripping still, shivering and amazed, staring at Christ, in the sun, on the other side of the fire—thinking a little, perhaps, of what happened by another coal fire, and having had no word once changed with him by his Master since that look of his,—to him, so amazed, comes the question, " Simon, lovest thou me?" Try and feel that a little, and think of it, till the scene comes home to you;—and then look at Raphael's cartoon of " The Charge to Peter." Note first the bold fallacy, the putting all the apostles there, and making them witnesses of Peter's receiving the charge. Note the handsomely curled hair and neatly tied sandals of the men who had been out all night in the sea mists and on the slimy deck. Note their convenient dresses for going a fishing, with trains that lie a yard along the ground, and

goodly fringes, all made to match, an apostolic fishing costume. Note how Peter, especially (whose glory was in his wet coat girt about him, and his naked limbs), is enveloped in folds and fringes, so as to kneel and hold the keys with grace. No fire of coals is there, nor lonely mountain shore, but a pleasant Italian landscape, full of villas and churches, and with a flock of sheep to be pointed at; and the whole group of Apostles, not round Christ, as they would have been naturally, but straggling away in a line, so that they may all be shown. The simple truth is, that the moment we look at the picture we feel our belief of the whole thing taken away. There is, visibly, no possibility of that group ever having existed, in any place, or on any occasion. It is all a mere mythic absurdity, a faded concoction of fringes, muscular arms and curly heads of Greek philosophers."

But Mr. Ruskin goes, to my mind, a little too far in this keen, cutting criticism of an accepted great work, since he makes no allowance for the circumstances of the period when Raphael painted these truly grand conceptions, most probably by direct authority and command of the Pope. In judging of a Work of Art it is not safe or fair to ignore the intention of the artist. In the case of the picture of "The Charge to Peter" the intention seems to have been to offer homage to the Papal dignity, and therefore to represent St. Peter in his brightest character, as symbolizing a cardinal point of doctrine of the Church of which Raphael was an enthusiastic follower. Richardson considered the picture to have been painted in pure compliance with the positive direction of the Pope, and that therefore no fault should be imputed to the painter, who, had he chosen to portray the scene as it actually occurred, would certainly have represented it in a masterly manner. Doubtless the evil consequences of this kind of religious idealism were, as Mr. Ruskin says further on, instant and manifold: "So far as it was received and trusted in by thoughtful persons, it only served to chill all the conceptions of Sacred History which they might otherwise have obtained. Whatever they could have fancied for themselves about the wild, strange, infinitely stern, infinitely tender, infinitely varied veracities of the life of Christ, was blotted out by the vapid fineries of Raphael. The rough Galilean pilot, the orderly receiver of custom, and all the questioning wonder and fire of uneducated apostleship, were obscured under an antique mask of philosophical faces and flowing robes. The feeble, subtle, suffering, ceaseless energy and humiliation of St. Paul were confused with an idea of a meditative Hercules

leaning on a sweeping sword (as in the "St. Cecilia" in Bologna); and the mighty presences of Moses and Elias (in the "Transfiguration") were softened by the introduction of delicate grace, adopted from dancing nymphs and rising Auroras."

There is, as usual, a good deal to be said on the other side. "Every generation stands on the shoulders of its predecessor," and thus the modern School of Artists has the advantage of the example and precepts which the great masters of old have bequeathed to them. The aspirant for fame, in the present day, must recollect that he has advantages denied to those who revived the Arts after centuries of decay, and deprived of the aid of the means of instruction we possess in the splendid collections of pictures and sculptures, and the treatises on the theory and practice of Art by such men as Reynolds, Fuseli, Barry, Leslie, Ruskin, Harding and Burnet; while in France and Germany the student is even more carefully trained. But, wherever the study of Art is recognized as an essential part of education, the best elements are found for the production of good Art.

What I think is essentially needed is just appreciation on the part of the public, liberal pecuniary support by the Parliament, and intelligent criticism. Art loses some of its benefit, and much injustice is done to artists, by the want of intelligent and honest criticism What constitutes sound criticism? or, in other words, what is embraced in the mysterious title of Connoisseur? This question involves another: Does connoisseurship imply the ability to execute? The best qualified critic is undoubtedly he who combines with an entire knowledge of the technicalities of Art—of what it can do, and what it cannot do—an acquaintance with all the appearances of Nature and their combinations. A painting is sometimes praised for its *softness* or condemned for its *hardness*. "I like it because it is bold," says one. Another says: "These rocks would have been better if they were not so *cold*"; and all works are distinguished by them under one or other of such characteristics, and estimated accordingly. And thus those who take upon themselves the responsible and difficult duty of criticism, will often endeavour to impress the public with an exalted idea of their artistic knowledge, by the merciless way in which they treat works which cost those who produced them the highest efforts of mind and feeling. Furnished with a complete stock-in-trade of terms, a well-appointed battery of technical missiles fresh from the armoury of his

Art vocabulary, the critic lays about him with *chiaroscuro* and *impasto*, *breadth* and *warmth*, *pre-Raphaelite* and *realism*, and makes, in the eyes of an undiscerning public, quite a formidable show of artistic lore, by which mediocre works are trumped up as masterpieces, and the mature productions of experienced artists, approved as such by consummate judges, are flippantly noticed or charitably "damned" with the faintest of praise. The power wielded by some of these critics is enormous, and the influence exercised upon the fortunes of artists who may have genius and ability, but whose reputation is not yet solidly established, is frequently fatal. Mr. Philip Hamerton, in his essay on "Picture Buying," quotes an instance where an adverse criticism by a well-known critic, deprived a popular artist of all chance of getting his living. He refers also to a melancholy poem, which was said at the time (on the authority of *Punch*, in whose pages it appeared) to have been composed by a Royal Academician. "I believe I can quote the poem from recollection," says Mr. Hamerton, "for its mournful music lingers in my memory yet":—

"I takes and paints,
Hears no complaints,
I'm sold before I'm dry;
When savage Ruskin
Sticks his tusk in,
Then nobody will buy."

"Here we have an instance of an accomplished gentleman, who, having attained by his talents and industry to the highest rank of an artist, is reduced at once to poverty by the hostility of a critic. Prosperity and happiness breathe in the first few lines of the poem, which opens like a sunshiny morning:

"I takes and paints,
Hears no complaints,
I'm sold before I'm dry;"

This was indeed the sunshiny morning of the painter's life. But a malignant influence darkens all "When savage Ruskin sticks his tusk in." And there is a touching pathos in the last line, which only a painter can adequately appreciate: "Then nobody will buy."

There are several kinds of judges: the competent judge, who, without being an artist in practice, knows enough of both Art and Nature, and is sufficiently independent, to from a correct and honest judgment; *secondly*, the *soi-disant*

critic and connoisseur, who goes close up to a picture, and after having felt it, and perhaps smelt it, and taken an observation at it through a tube made of his last trenchant criticism, pronounces it to be decidedly *hard* or charmingly *soft*, approves of the *impasto* but finds fault with the *chiaroscuro*, praises faintly the *aerial perspective*, but utterly scouts and condemns the fore-shortening of *the left horn of that cow in the middle distance*. Lastly there is the simple, unpretending lover of Nature and Art, who enjoys Art sincerely, but knows nothing at all about it, neither traditionary rules nor learned technical phraseology, but simply his unaffected delight in the picture.

Rosetti says: "The debate is always whether the artist or the public is the true appraiser, by whose verdict we must walk. The question of popularity, though not of enduring repute, is of course settled by the public, and need not occupy us. The further question has two sides, that of intellectual power, and that of ultimate artistic excellence. The former may be determined quite as readily by the public, and with greater freedom from bias, as they are so little swayed by the bearings of the latter question. They alone know the ultimate excellence of the work, because they alone are conscious of the things needed to be done in Art, and the means of doing them. We cannot certainly say that every artist will decide better than any outsider; some artists are bad ones, other prejudiced, capricious, or disingenuous; but in the long run the verdict of their class will carry it."

I shall conclude my remarks with some allusions to landscape—that branch of Art for which this country offers large scope in selection, and for the convenient study of which its climate, so favourable for outdoor sketching, is admirably adapted.

The landscapes in South Africa are said to have the disadvantage, as compared with the scenery of humid climates, that distant objects are not sufficiently veiled by the vapour of intervening atmosphere. I have never, I confess, been able to regard this otherwise than as a clear advantage to the painter who is conscientious in the rendering of detail, and who can so frequently count on fine weather for his field studies. Obtrusive detail he can readily avoid by a judicious choice of a point of sight, and by a right employment of light, middle tint, and shade. Then in winter and in early spring, and sometimes in other seasons, the air is charged with vapour sufficient to satisfy the most fastidious painter of misty effects.

Our coast scenery is really grand, and I am sure that Stanfield and Turner would have lingered for weeks along the shores of Camp's Bay, Hout Bay, Cape Point, and at numerous other spots along our southern coast, from Simon's Bay to Natal—and produced works second to none for grand forms of cliffs and rock, of imposing waves breaking and surging, and, above all, of splendid sunrise and sunset effects, with occasional stormy skies of much solemnity and grandeur.

Our mountain and sylvan scenery is highly picturesque, and I have only to name Michell's Pass, Tradouw, Montagu Pass, the Katberg, Bain's Kloof, and the Knysna, to recall visions of beauty in form and colour singularly well adapted for the landscape painter's art. Does he wish to study the human form? He will find models among untutored and unspoiled Kafirs, far removed from the centres of civilization. People speak of the Bay of Naples as a type of all that is grand and lovely in landscape; but I would ask any one who has stood at sunset on the neck between Camp's Bay and Cape Town, if he has ever looked upon a scene that surpasses it in noble and graceful lines, and beautiful colour.

The best advice I can give to our students of landscape is—after they have acquired the discipline of eye and of hand which enables them to draw the form of any object, and after having made themselves acquainted with the implements and materials of their art—to take their stand out of doors, and pitch on some simple subject at first, and faithfully to imitate form, light and shade, and colour, "rejecting nothing, selecting nothing, scorning nothing," remembering that nothing will teach colour, and light and shade so well as Nature. Awkward form may occasionally be encountered, which a practised and judicious sketcher will overcome, often by merely shifting his point of view, or otherwise by modification, founded on the close recollection of similar objects presenting a more picturesque appearance, but adhering faithfully to colour and light and shade, which, in Nature, are absolutely faultless.

It cannot be too much insisted on that the actual study of Nature is the only true way of acquiring the power of representing Nature; provided some instruction has gone before, in the use of the materials. Style can only be acquired by copying the reality, though principles are learnt from the study of the works of great artists. Want of talent and want of taste are common lamentations, and common excuses; but wonders may be achieved with ordinary ability, if helped by unremitting diligence.

Nothing is denied to well-directed labour, nothing is to be obtained without it. The essential requisite is application, more unpretending than *genius*, for which thousands sigh. It frequently happens that natural talent, conscious of its powers, resists discipline, and deems labour superfluous, but the course of a mind so constituted is always eccentric, accomplishing nothing with certainty. It flutters round every object, and rests on none.

Above all a feeling of satisfaction with one's own performances should be jealously guarded against; and we should remember that men of the highest genius, and of established renown, are never entirely content with their work. They are ever striving to reach a more distant goal, ever picturing to themselves an ideal perfection never to be attained, for Nature mocks our supremest effort. "He who attempts great things may expect great things He who aims at excellence will be above mediocrity, he who aims at mediocrity will fall short of it."

At the same time the artist should avoid minute elaboration of parts, or what is technically called *finish*. An excess of labour is destructive of freedom of execution. and leaves too little for the imagination. The spectator, in beholding a natural scene, derives pleasure, not from a minute and microscopic inspection of every part of it, but from his impression of a harmonious whole.

It is for this reason that the unfinished sketches of a really clever artist give such delight. In his "Modern Painters" Mr. Ruskin devotes a chapter to "Finish," from which I take leave to give an extract:—"Our best finishing is but coarse and blundering work after all. We may smooth, and soften, and sharpen till we are sick at heart, but take a good magnifying glass to our miracle of skill, and the invisible edge is a jagged saw, and the silky thread a rugged cable, and the soft surface a granite desert. Let all the ingenuity and all the art of the human race be brought to bear upon the attainment of the uttermost possible finish, and they could not do what is done in the foot of a fly, or the film of a bubble."

A picture has, in some measure, an advantage in not being finished in every detail:—"The imagination rejoices in having something to do, springs up with all its willing power flattered and happy, and ready with its fairest colours, and most tender pencilling, to prove itself worthy of the trust, and exalt into sweet supremacy, the shadow which has been confided to its fondness. And thus, so far from its being at all an object to the painter to make

his work look real, he ought to dread such a consummation as the loss of one of its most precious claims upon the heart. So far from striving to convince the beholder that what he sees is substance, his mind should be to what he paints as the fire to the body on the pile, burning away the ashes, leaving the unconquerable shade an immortal dream. So certain is this, that the slightest local success in giving the deceptive appearance of reality—the imitation, for instance, of the texture of a bit of wood with its grain in relief—will instantly destroy the charm of a whole picture; the imagination feels itself insulted and injured, and passes by with cold contempt: further, in consequence of that other character of the imagination, fatigueableness, it is a great advantage to the picture that it need not present too much, and that what it does present may be so chosen and ordered as not only to be more easily seized, but to give the imagination rest, and, as it were, places to lie down and stretch its limbs in, kindly vacancies beguiling it back into action with pleasant and cautious sequence of incident, all jarring thoughts being excluded, all vain redundance denied, and all just and sweet transition permitted."

III.

THE IMPORTANCE OF INSTRUCTION IN DRAWING, MODELLING AND DESIGNING, IN THE PRACTICAL BEARING OF THESE SUBJECTS ON TRADE AND MANUFACTURES.

By R. H. Hammersley-Heenan, M.I.C.E., *District Engineer Midland System, Cape Government Railways.*

Before endeavouring to define what Drawing, Modelling and Designing really mean, it will be well to first analyse the title of my essay, and set forth briefly and clearly what I wish to prove, and what I should like those responsible for the education of the youth of this country to take into their earnest consideration.

An idea, which must be considered by all sensible men and women an insane one, fills the brains of the vast majority of fond parents, that there are certain subjects taught at schools—generally known as "extras"—that are indispensable, as the "finishing touches," the "gilding," or "varnishing," of their children's education. These are known as Music, Singing and Drawing. They are seldom looked upon as substantial, or as anything more than a something that can be had by the payment of an extra fee. If a girl can strum through a valse, sing a ballad, and daub a few flowers on a plate, she is "accomplished." She may be, but still, I venture to say, she is very far indeed from being educated, in the true sense. This superficially laid-on coating of so-called "school finishing," which is ruinous to the higher development of intellect, has been, to a certain extent, unavoidable in this country. Parents could not, in many cases, afford a full and necessarily lengthy course at an expensive school; they were therefore obliged to get the most they could for their money, and schoolmasters and mistresses rose to the occasion, and supplied a genuine "Brumagem" article.

My object in writing this essay is not to attempt to throw ridicule upon, or to disparage in any way, the educational

system of this colony, but to try to bring into fuller relief subjects that have not been fairly treated, and upon the development of which much depends, as I hope to show further on.

In approaching any question touching upon education, one naturally turns to the continent of Europe, for there we have a living example in the great Germanic Empire of what a people from within itself can do, when its brain is quickened, and its hand is skilled. It was the superior education of the Teutonic soldiers over the French that enabled them to march triumphantly across the plains of Alsace and Lorraine, and to defeat the boasted armies of Napoleon, and to take up their residence in the Palace of Versailles, a few miles from the capital of France.

In the schools of Germany there are no shams; "accomplishments" are left to other nations to indulge in, but this common-sensed people *teach* drawing, painting and modelling, not to the dilettanti exclusively, but to *all*. These subjects are as much a part and parcel of the course of school training as geography, chemistry and mathematics, and no one can matriculate unless he, or she, as the case may be, has obtained the standard number of marks in drawing.

It would be interesting, but beyond the scope of this paper, to give a history of the Polytechnic schools of Europe, which have done so much for the people of the countries that have adopted them; and which, it is to be hoped, will be introduced, in some form, into this colony ere long.

Before entering into a discussion as to the value of Art to Trade, it will be well to thoroughly understand what is meant by Art? I will answer this question in the words of the greatest authority that has ever written on the subject—words which are impressed with that noble truthfulness, that fulness of expression, and that beauty of finish that characterize all Mr. Ruskin's writings:—

"Painting," he says, "or Art generally as such, with all its technicalities, difficulties, and particular ends, is nothing but a noble and expressive language, invaluable as the vehicle of thought." Further on he speaks of it as a language which sometimes becomes poetical, as instanced by the works of the master hands, such as Rubens' "Descent from the Cross." It is not, however, with the old masters, or high Art that we have to deal, but with the more humble subjects of Drawing, Modelling and Designing.

Now, as painting is the language by which the artist describes Nature, as he sees and conceives it, so is drawing the language most commonly adopted, in professions and

trades, by which ideas and thoughts are conveyed, that could not be expressed in words.

In modelling and designing, instead of using the letters of the alphabet, we adopt lines and surfaces, to convey to each other the ideas of forms and shapes that are created in our brains. I can imagine no other means by which it could be done. Let us take a case, and suppose for a moment that there is no such thing in the world as a plough, and that a man suddenly conceives the idea of making one; he has it clearly before his own mind's eye, worked out in every detail. He goes to a blacksmith, and tries to describe what he wants made; but he cannot succeed in getting his idea clearly conveyed; words cannot describe the complicated curves of the moulding board, or the peculiar shape of the coulter. He is helpless, for he cannot draw, and he has not skill or time to enable him to fashion a model.

This imaginary case is typical of thousands in real life.

I must pass on to a more general review of the subject, and try whether I can find the links that bind our Commerce with our Arts.

It requires little to show how the arts of drawing, and designing, have, and are influencing trade and manufactures in all quarters of the world, and how they must inevitably continue to do so. It is, therefore, of vast importance to the rising generation that Drawing should be looked upon and treated as a necessary part in every boy's and girl's education. By the neglect of such instruction in the past, many men with the genius of a Stephenson, a Wedgwood, or a Watt, may have sunk into their "graves unknown," because their hands were too unskilled to produce what their eager brains were ready to devise.

There are two kinds of drawing, viz., "Freehand" and "Mechanical." The former is executed by the hand, unaided by any mechanical appliance, save a pencil or brush; whereas, in the latter, compasses, rulers, and various other instruments are resorted to—hence the name "mechanical."

Both these systems of drawing have their own particular fields of usefulness; both are invaluable to trade and commerce, and both should be learned by every school boy and girl. But, unfortunately, so far from this being the case, I am well within the mark when I say that not one in three hundred could draw an ink bottle of the commonest pattern correctly, or lay down, to scale, the plan of a Kafir hut—which is as humble a thing in Architecture as I can think of at the present moment. Surely that is a blot

upon our lauded civilization! Is it not humiliating to know that, away in their mountain caves, the Bushmen—perhaps the lowest type of humanity—can, with a piece of red earth, throw the fire of life, and spirit, into the animals they draw on the rocks around them, while we, in the great majority of cases, are satisfied if our children can copy the outline of a head, a leaf, or something equally simple; and how few are they who can even do so much!

Now, it may be asked: What is the practical advantage to be gained by learning to draw and paint?—Or, it may be said by some, we are not going to make Artists, or Architects, of our children, we therefore see no need for it. But this is hardly logical, for you teach them reading and writing, although it may never enter your heads that they should take to literature, as a profession; you have them instructed in geometry, without intending them to be land surveyors; and you have them drilled, although you have no intention of making soldiers of them.—Why, then, omit drawing? Is it not as useful as geometry?—and in many cases more so? We will see.

To get at least some idea of what Art—*i.e.* drawing pure and simple—has done for Trade, we need not go far; in fact, no further than the first soft goods shop we come across. We enter it, and our difficulty is not so much in finding articles that depend on Art for their sale, as in finding those that do not. People have now become so accustomed to see beautiful designs on curtains, shawls, calicoes, carpets, mats, rugs, silks, wall papers, and hundreds of other articles which I cannot mention, that they seldom halt to inquire as to how they are produced; they have a muddy idea that they are made by machinery in some wonderful manner that they do not understand. But a moment's hesitation, and thought, will show them that machinery is only a means employed for multiplying, at a low price, the original design, which was the joint product of brain, hand and pencil, and to whose credit must be placed every copy produced.

A short time ago I had an opportunity of going through one of the largest calico printing works in Manchester; there they had no less than 6,000 copper rollers, on all of which were engraved different designs; and as the patterns go out of fashion the rollers are turned down, and new designs substituted. The average price of an engraved roller is £5, which brings the value of their stock, in this branch alone, up to £30,000 sterling. It may not be out of place to give here a short extract from my diary, written

on the day I visited the works:—"After lunch we went to Hoyle and Company's Calico Printing Works, and saw there the most marvellous application of Art, Science and Mechanics that I have ever witnessed. By Art, patterns are drawn, and copper rollers engraved with strangely beautiful designs. By Science, the impressions printed on the calicos are fastened to the texture, and given the required colour. By Mechanics, machines are made to work in a truly wonderful way; they wash, they dry, they bleach, they stitch, they starch, they blue, they iron, fold and measure. As I watched it all, I could not help thinking that if it were possible for any one to follow a pound of raw cotton from the moment it leaves the negro's hands in America, until it becomes a piece of print, he would witness a surprisingly remarkable series of changes; but, after all, not so astonishing, I think, as the fact that he can buy it for threepence half-penny a yard."

It may be argued—and is by a great many—that "an eye for drawing" is a special gift, and that only few can expect to excel in it. Within certain limits this is true; but surely it should not be advanced as an argument, that because we cannot write like a Macaulay we should not write at all! Certainly not. The light of a match is very insignificant when compared with the sun; but who disputes the usefulness of the former? And so it is with Art; between the drawing of a wheelbarrow and the designs of Cologne Cathedral there is a great gulf fixed; but it is doubtful if we should ever have seen our magnificent triumphs of Architecture if barrows, carts and tools were not first invented and designed.

I must, however, guard against being misunderstood; I do not advocate that drawing should be taught simply on the chance of developing latent genius, but as a means of making better men and women of our boys and girls; better in the sense of being more useful, and more qualified than they are at present to fight the battle of life.

It must be patent to everybody—who has any friction at all with the world—that the struggle for existence is day by day becoming keener. The applications for appointments in Government and mercantile establishments far exceed the numbers required, therefore employers can pick and choose as they wish, and naturally they endeavour to select the fittest. Every additional qualification or accomplishment which one youth possesses over another is a factor that must tell, sooner or later, in favour of him who has it. To this rule I know of no exception.

With regard to the usefulness of a knowledge—even a slight knowledge—of drawing, which, to my mind, is as self-evident as that shorthand is an advantage to a clerk, I can readily show why it is so; and in doing this I will draw from my personal experience. For some years it formed part of my duty to supply a gentleman in the same department with information to enable him to indent on England for stores required. He could draw correctly, and always gave a small marginal sketch of everything he ordered, that had not a common trade name. The result was that instead of vexatious mistakes occurring, we invariably received what we wanted, and money and time were saved. This gentleman had no special training for the position he filled, but having a knowledge of drawing he soon found it far easier and more satisfactory to give sketches of oil cans, lamps and tools of special patterns than to rack his brain in the vain endeavour to describe them in words.

Again, those who live in country places are often obliged to make a long and expensive journey, in order to personally explain to a mechanic some duplicate piece they may require for their machinery, or some slight alteration they may wish to have effected. This would, in the vast majority of cases, be avoided by a knowledge of drawing. To represent on paper an ordinary cog-wheel, is not a very artistic feat, but how few are there, even amongst mechanics themselves, who can do it? Surely such a state of things cannot be looked upon as satisfactory?

Having pointed out a few of the many advantages of a knowledge of Drawing and Designing, I will take it for granted that the advisability of having the subjects taught is admitted, and proceed to discuss the practicability of having them introduced into schools, to rank with algebra, Euclid, &c. This is no new idea, for it has long since been put in force, with the happiest results, not only in Germany, France and Russia, but by the Commissioners of National Education in Ireland, in all their Model Schools.

It would, of course, be impossible in this country at once to make drawing a regular subject in the ordinary school course, inasmuch as the teachers are, with rare exceptions, unqualified to teach it. But, I see no reason why it should not be at once made a rule, that no teacher of the 1st class should receive his, or her, certificate until he, or she, had qualified in this particular.

There should be no difficulty in this, as, fortunately, we have, in at least four towns of the colony, excellent Art masters, whose services are available on strikingly easy

terms, and with whom arrangements could be readily made by the Superintendent-General of Education, to give lessons and hold examinations at certain times and places. And when, under such a system, the number of teachers were sufficient, drawing should be made a compulsory subject at all 1st class Government schools. In the meantime there is no reason why the various Schools of Art in the Colony should not be largely made use of, with a view of accomplishing the same ends.

In conclusion, I have only to express the hope that the people of this country will soon come to look on Art, not only as something to please the eye and gladden the senses, but as a factor that is capable of adding materially to our happiness, prosperity and wealth.

Let those who think that the art of drawing, like poetry, is only sent by special favour of the gods, remember, and take courage from the words of Carlyle, who wrote: "Genius is the power of taking infinite pains."

IV.

THE ESTABLISHMENT OF AGRICULTURAL SCHOOLS AT THE CAPE.

By A. Fischer, *Professor of Agricultural Chemistry at the Stellenbosch College.*

Before I enter upon the subject of my lecture, I have first to ask your indulgence with regard to my deficient pronunciation of the English language. The time I have had for practising this language, so very hard for foreigners to acquire, has been too short. Secondly, you must not expect me to give you a complete or an exhaustive treatment of my subject, because, until now, most of my time I have had to use for the teaching of pure chemistry, and only the holidays can I fully devote to my special subject, agriculture. When I arrived here, two years ago, I expected to be able to do something at once, to watch the establishment of an agricultural school. But this plan could not be carried out, because no support was forthcoming in these hard times from Government. Thus I had to confine my work, for the present, to the teaching of science only.

Although my enthusiasm for the good cause has received many a hard shock during these two years, I have also had much valuable experience of South African agriculture, and have seen too much of this beautiful country to be very easily discouraged. I am confident there will soon be a revival in our agriculture. The first and most important step in this direction, however, is the establishment of an agricultural school connected with a well-conducted model farm. And when I received the honouring invitation to give one of the lectures to be delivered during this Exhibition, I could not for a moment be in doubt as to which subject to choose; and I shall be perfectly satisfied if, to-day, I succeed in somewhat promoting our cause, which is at the same time the cause of all South African farmers, even of those who do not yet believe in it.

The difficulties which are in the way of the establishment of agricultural schools do not solely arise from want of means, but are mainly due to the indifference and want of confidence, by a great portion of our educated classes in the necessity that exists for the study of science generally. The

different branches of natural science have, in this country, still to struggle for an independent position, such as is granted to literature and mathematics. What our country wants are specialists in the several branches of science and not mathematicians, or men of letters who have some dim notions of science. The question here is not so much to know the subject, but to be able to do it. We want men who have such thorough knowledge of chemistry, of botany, of mineralogy and geology, as to make practical use of their knowledge to the direct benefit of the colony. Those who in this country still like to treat science as the Cinderella amongst the subjects of teaching, constantly compare the time which we devote to science with the much shorter time given to it in many English universities; but if we have to discuss the question of teaching science, we must turn our eyes, not to England, but to the Continent, especially to France and to Germany. In these countries the study of science is perfectly independent, and its beneficent influence on agricultural and all branches of industry and manufactures manifests itself everywhere.

For the sake of comparison, I beg to draw your attention to a part of the lecture delivered a few months ago by Professor Henry E. Armstrong, President of the Section for Chemistry of the British Association. "It will not suffice," says the Professor, "occasionally to set a promising student to investigate, but a number of students, as well as the staff, must always be engaged in original work: in fact, *an atmosphere of research must pervade the college.* It cannot be too clearly recognised that it is this which characterises and distinguishes the German schools at the present time. The student does not learn so much from the one special piece of work with which he is occupied, but a number of his fellow-students being also similarly engaged, the spirit of inquiry is rife throughout the laboratory: original literature is freely consulted, and they thus become acquainted with the methods of the old masters; vigorous discussions take place, not only in the laboratory, but also at that most useful institution, the 'Kneipe;' the appearance of each new number of the scientific periodicals is keenly welcomed;—in fact, a proper spirit of inquisitiveness is awakened and maintained, until it gradually becomes a habit. Probably there is less actual routine teaching done by the staff in the German schools than in our own. I am proud to own my *indebtedness* to one of them, and I can without hesitation say that I never truly realized what constituted the *science* of chemistry until I came under its influence.

But to realize the state which I have pictured—*to create an atmosphere of research in our science colleges in order that it may be possible for our students to obtain complete training in chemistry*—several things are required. In the first place, it will be necessary that the students come to them better prepared than they are at present: as a rule, they are so ill-prepared that it is very difficult, if not impossible, in the time at disposal to give such preliminary instruction as is indispensable before higher work can be attempted. Their mathematical knowledge is so ill-digested that it is more often than not necessary to begin by teaching simple proportion, and they look aghast at a logarithm table. They cannot draw; so far have we advanced in our civilization that the subject is more often than not an 'extra' in our schools. They understand a little French; but German, which may almost be called the language of modern science, is indeed an unknown tongue to them. I do not complain of their want of knowledge of science subjects, but of the unscientific manner in which they have been trained at school, and especially of the manner in which their intellectual faculties have become deadened from want of exercise, instead of developed and sharpened. Too many have never acquired the habit of working steadily and seriously; they have not learnt to appreciate the holiness of work, so that they render the office of teacher akin to that of slave-driver instead of to that of friend." Thus far the famous English professor; and every unprejudiced man, who in this country has anything to do with the teaching of natural science, will agree that with us the evils are, on the whole, the same. These remarks of Professor Armstrong explain at the same time the slight amount of original work done in British laboratories.

Dr. Percival, the late headmaster of Clifton College, said lately at a meeting at Oxford: "If twenty years ago this University had said: From this time forward the elements of natural science shall take their place side by side with the elements of mathematics, and shall be equally obligatory, you would long ago have effected a revolution in school education."

We have to thank the indefatigable efforts of our champion in the field of natural science, Professor Dr. Hahn, that now already chemistry, at least, occupies in the colony a more important position than in many English universities; and very much has been done for this subject also by the Superintendent-General of Education, who fully recognises the value of the study of science. But the power of

literature and mathematics in our university arrangements is still overwhelming, and we must not rest in putting forward our claims until our young men can take the degrees in science alone, as they do now in literature, and until one subject of science is made compulsory for all students in the matriculation examination. Charles Kingsley, speaking to the boys at Wellington College, said: "The first thing for a boy to learn, after obedience and morality, is a habit of observation—a habit of using his eyes. It matters very little what you use them on, provided you do use them. They say knowledge is power, and so it is—but only the knowledge which you get by observation. Many a man is very learned in books, and has read for years and years, and yet he is useless. He knows about all sorts of things, but he cannot do them." So far Kingsley, and he is quite right. In a proper system of education we must connect our instruction on the one hand with the results of human intercourse, and on the other hand with the results of man's experiences of Nature, and explain and extend both. We thus, naturally, obtain the two leading or trunk lines, along which education must be carried, namely, history, taken in a liberal sense, as including languages, literature and art, and the natural sciences. Since each of these intellectual spheres requires a body of special ideas, each has also its own special development; that is to say, the one cannot be substituted for the other, or the result will not be a harmonious mental cultivation. Had this, from the beginning, been duly laid to heart, there never could have arisen that nearly impassable, gulf between science and literature, which threatens to split the whole intellectual life of our time into two sharply divided camps, while it has already deprived so many men of their belief in the actual or essential harmony between the scientific, religious, or moral possessions of mankind. If, however, we, the scientists, knew as little of literature as most literary men know of science, we should simply be treated as uncultured barbarians, and be refused all right of pronouncing an opinion. But what is fair for the one is also reasonable for the other. "What is sauce for the goose is sauce for the gander."

That every college can set apart, for every student, sufficient time for the natural sciences is shown by that type of German school known as—the "Real Gymnasium." When a young man has passed through such an institution, and is going over to the university, he possesses not only a good knowledge of literature, languages and mathematics, but also of the more important branches of science. We all know that

the young people possess a wonderful inclination to make collections, and if the teacher of science only understands to direct and to make use of this inclination, much good work can be done, even in a small number of hours. Such a general study, especially of botany and geology, has also the great advantage that the young generation begin to look at their country with different eyes, and that they learn to know why they love it, and why they value it. Such short scientific excursions are, at the same time, for the young people, a much more convenient recreation than certain games which may be very suitable in the cold and damp climate of England, &c., but certainly not under our cloudless sky. If a schoolboy plays every day after his lessons for two or three hours at football, no one will believe that he is able to prepare in the evening his work for the next day in a satisfactory manner. I well know the saying: *Mens sana in corpore sano*; but I know also quite well that, by no other means the whole system of a young man is better strengthened, and at a smaller loss of time than by the obligatory practice of systematic gymnastics. If in connection with this striving after strengthening and hardening of the body the faculty of national defence is developed, then the real patriotism and the feeling of common interests are at the same time cultivated, qualities which with too many of us are still conspicuous by their absence.

The first attempt at establishing an Agricultural College was made in 1883 by the Council of the Stellenbosch College. Their plan was good and sound, as may be seen in the memorandum drawn up at the time by Professor Hahn, and submitted to Parliament for the purpose of obtaining a subsidy. As to the need of practical instruction in agriculture, and the benefit derived from it by farmers, the pamphlet says: "It is needless to dwell upon the importance of the work done in the laboratory and lecture room, or upon the usefulness of an Agricultural Museum for purposes of instruction, but it may be expedient to point out the necessity of having an experimental farm established in connection with the teaching branch of an Agricultural College. In the first place, the experimental farm is absolutely necessary for the practical application of the facts taught by the sciences of vegetable physiology and agricultural chemistry. On such a farm the student investigates and studies the favourable and unfavourable conditions for the growth and development of plants, and applies the results of work done in similar institutions in other countries, and studies the best mode of adapting these

results to his own climate and soil. It is evident that his labours on the experimental farm can yield accurate and valuable results only when they are systematically controlled by the chemical analyses made in the laboratory of soil, manure, water for irrigation, seeds, parts of plants and fruits. On the experimental farm the student acquaints himself with the use and the construction of agricultural and viticultural machinery, by means of which the farmer becomes more independent of manual labour. Experiments should likewise be made by the student with regard to the rearing of new crops and fodder-plants, the rotation of crops, &c.,—the importance of which cannot be overrated in a country like ours, where there are only two agricultural industries, viz., wine-growing and corn-farming, although the beautiful climate and the unsurpassed fertility of the soil render this colony most suitable for the raising of many products, which in other countries are important articles of export. Equally important for the young farmer is the instruction which he will receive on the experimental farm and in the chemical laboratory, in agricultural economy and the utilization of agricultural produce. And these cannot be taught successfully in all their bearings without materials which have been raised on a soil, and with a manure, of known composition and under known climatic influences.

"Whilst the student of the Agricultural College thus derives so much benefit from the work done on the experimental farm, it is obvious that the farming population at large will profit from the advantages which such an institution offers. It will be an essential item in the programme of the work to be done on the farm that it is to be a place where advice can be obtained on all questions concerning practical agriculture. And when farmers have come to recognise the material value to themselves and to the colony of such advice and knowledge, there is no doubt that the establishment will, in course of time, become self-supporting. Many instances may be adduced where similar institutions in Europe have gradually become entirely self-supporting, after the value of the information obtained on these experimental farms had made itself felt in all directions. As the Stellenbosch College is situated in the centre of an agricultural district, many farmers can easily avail themselves of the opportunities of instruction which an Agricultural Museum offers, where improved implements and machinery will always be exhibited, and their construction explained and illustrated.

"When the Agricultural College shall have been deve-

loped on these lines it will not fail to exert a most beneficial influence on the farming population of the whole country. The principle of combining theory with practice has borne good fruit in other countries, such as New Zealand and India, where similar institutions have become the busy centres from which useful information is disseminated in all directions."

But at the time, this plan of the Council of the Stellenbosch College, was not carried out, as no support was granted by Parliament in consequence of the general depression of the country. However, the Council of the Stellenbosch College still hopes to establish a branch for agriculture; but I am unable to see where the means are to come from, as the building of the new College has absorbed nearly £10,000, and as during the last session of Parliament the asked support was refused. This is certainly to be regretted, because some of the rooms of the new College are specially intended for teaching agriculture. But, as I am not going to have anything to do with teaching agriculture, only theoretically, I made about three months ago, in connection with Professor Hahn, another attempt to induce Government to put one of the Government estates, with the necessary buildings, at the disposal of an Agricultural School. We first thought of the Drostdy in Worcester. All went on well. The Superintendent-General of Education, Dr. Dale, took a great interest in this plan, and promised all possible support. A number of gentlemen also promised pecuniary support for the first years, and many manufacturers of agricultural machinery in Europe offered implements, and models of implements, partly gratis or for half price. In short, we felt almost sure that our plan would succeed; but when we called on the Commissioner of Public Works and Crown Lands, and explained to him all that we had done so far in this line, we received, after some time, the reply that Government could not accede to the proposed scheme, as it would find itself compelled to look about for a residence and office of the Resident Magistrate elsewhere. In connection with this I may mention that, the people of Worcester are very anxious that their Magistrate should live in the centre of the village rather than in the Drostdy, which is too much out of the way.

I fully recognise the importance of the step taken by Government in buying Groot Constantia, because I feel convinced that this will mark a new era in our wine industry. But is it only the wine-farmer that has a claim to the assistance of the Government? Those who have in hand

the management of the affairs of the country in times of depression like the present have certainly not an easy task to perform. But is it not like a patient who does not wish to buy medicine because he cannot make any money during his illness, if a country like ours, which depends solely upon the success of agriculture, does not wish, in these hard times, to go to the expense of giving to the young generation of farmers a thorough practical and theoretical training? This is the medicine which our country wants now, and this medicine has proved successful in many a country which had to go through times as we experience now. Indeed, we find that with strong and energetic nations hard, critical times were generally followed by a considerable revival of agriculture.

The Worcester project should not be abandoned, because there is hardly another place in which a convenient Agricultural College could be started with such comparatively small cost. The instruction of the students in English, Dutch, arithmetic and geometry would be supplied by the teachers of the good public school of that village, so that three specialists would be quite sufficient. One of the experts for tobacco culture might be stationed at this place, and to him the instruction in this branch of agriculture, which has a great future in this colony, might be entrusted. The situation of Worcester is most suitable for the establishment of the Agricultural College. By rail it can be easily reached from all parts of the colony; the soil and the climatic conditions are favourable to the cultivation of all plants which can be grown in this country; the Karoo is near at hand, and by adding a Karoo farm to the Worcester farm justice can be done also to the interests of the stock-farmers, as it must be one of the principal objects of the establishment to rear good and suitable animals for improving the stock of the colony. A real model dairy could further, without great expense, be established there, the more so as Mr. Wœhlin, one of the manufacturers of the "De Laval Cream Separator," promised me to supply us, gratis, with the whole equipment of a dairy for this purpose. By the way, it may be stated that without centrifugal machines no real first-class butter, that at the same time is able to stand long journeys, will ever be made in this climate; and the centrifugal machine which is undoubtedly most suited for our circumstances is "De Laval's Cream Separator," which is also found in this Exhibition.

Finally, the building of the Drostdy at Worcester would furnish most suitable rooms for teaching, for collections, for a chemical laboratory, &c.

The great question, however, is not so much where the agricultural school is to be established, but that one be established. No doubt the first agricultural school will soon be followed by a number of others, in which justice can be done to all the local circumstances. But, in order to teach young men the principles of rational agriculture, to show them how to apply science to agriculture, to enable them to interpret correctly the observations which they make in their work, or to apply them to their benefit, it is not absolutely necessary for them to study agriculture exactly on the same soil and under exactly the same climatic conditions as they have on their own farms. I remember, for instance, well, that the agricultural academy at Hohenheim, one of the oldest and most celebrated of Germany, was, in my time, attended by students who came from nearly all parts of the world, from South as well as from North America, from the most northern parts of Russia, as well as from Hungary, &c., in order to study there agriculture. The laws of Nature are the same everywhere, still it cannot be denied that it is of great value, if the young farmer has a chance of acquiring, also, a certain amount of such knowledge as may directly be used by him, without modifying or adapting it to his particular circumstances. But our climatic conditions are not so divergent as abovementioned, and if we cannot start several agricultural schools at once, it is certainly better to have, at least *one*, at a place which as much as possible suits all the different parties interested.

If our Government, in the interest of the whole country, is prepared materially to further the cause of agriculture, a considerable saving can be made by not creating a Ministry of Agriculture. The supporters of the scheme always point to the example of the United States of North America, but forget to state that the mere staff of that Ministry draws £3,000 per annum—exclusive of the salary of the Minister himself, and the grants for agricultural schools, laboratories, and experimental farms. Seeing that we cannot, at present, afford to keep up such a costly machinery, the appointment of a Minister of Agriculture is, for us, nothing but a luxury. If Parliament wants to do something beyond the establishment of an agricultural school, let it form a Department like that of the Superintendent-General of Education, which has proved so successful. For £500 or £600 a very suitable man can be obtained. The Forestry Department, the Veterinary Surgeon, the experts for wine and tobacco, the Hydraulic Engineer, and the Agricultural School might be

placed under this head. This Department would be attached to the Department of Public Works, and its responsible head in Parliament would be the Commissioner of Crown Lands and Public Works. The head of this Agricultural Department would have nothing to do with politics, which, I am sorry to say, paralyse too frequently, the carrying out of purely technical questions in this country.

As to the organization of the Agricultural College, I think that the best wherein the classes consist of a preparatory department, in which the teaching of science prevails, and of a senior department, with a course of two years of merely agricultural instruction. The preparatory department would correspond with the two matriculation classes of our colleges; and I trust that the University Council would not consider it beyond their functions, to establish an examination, somewhat equivalent to the standard of the matriculation examination, in which Greek, Latin and Algebra could be superseded by botany, geology and mineralogy. There can be no serious objection raised to this proposal, because the greatest admirers of a literary education can hardly consider it a loss when the small amount of Latin and Greek required of the candidates for the matriculation examination has to give way to so useful a subject as science is, and the less so as those students—as matters are at present—after having passed the matriculation examination immediately return to their farms, rejoicing at the idea of henceforth being at liberty to forget, in a very short time, all the Latin and Greek that has been drummed into them. Besides this, the farmer, under these present circumstances, cannot possibly spend so much money for the education of his sons who return to the farm as for those who learn a profession.

The instruction in science, in the lower department of the Agricultural College, will be supplemented by numerous excursions made in the neighbourhood. In teaching the several branches of descriptive physical science, special attention will be paid to all the parts of those subjects which refer directly to agriculture, for instance, in botany, to all the different sorts of plants growing in the colony; in mineralogy and geology, to the minerals and rocks which have contributed principally, to the formation of the different soils of our country, &c.

Only such students as had passed the science matriculation examination would be allowed to join the senior department. In this course the student would be taught the principles of working and improving the soil, and the best methods of cultivating those plants which can be raised

in the colony. The rearing, feeding and keeping of the domestic animals will form another part of the instruction in this course, and ultimately the students will be taught in what way the three factors of agricultural production—soil, labour, and capital—have to work together under given conditions in order to yield the greatest possible profit. How far such profit is obtained from the several branches of the establishment can easily be shown by a simple and regular system of book-keeping. From time to time the students will have to go through the whole establishment under the direction of their teachers, in order to gain a correct and complete idea of the whole working of the farm connected with the Agricultural College. The construction and the use of agricultural machinery, mensuration, different systems of drainage, &c., are also taught in this course. Even the use of the microscope, and simple chemical analysis, are indispensable subjects for the more advanced students.

I will not occupy your time by asking you to listen to the many changes and advantages which we soon shall enjoy if every year a good number of young men are spread over the country who know how to combine theory and practice in their agricultural pursuits. I have done this in the memorandum about the condition of the Cape agriculture submitted to Government for the last session of Parliament, and those who have an interest in the subject will there find further information. Nevertheless, I am not so sanguine as some in this country, who seem to expect that the immediate consequence of the erection of an Agricultural College, and model farm, will be accompanied by a sudden change of our quicksands and stony plains into flourishing fields and lawns. It is a fact that in all thinly populated countries, to which class the Cape Colony belongs, only the better varieties of soil will pay cultivation. It is also well known that any capital and labour spent in such countries on the cultivation of really poor soils, if they are not in the close neighbourhood of large cities, are simply lost.

It must be admitted that the South African farmer has some difficulties which are, partially, greater than in Europe. The water question is, among these, certainly the most prominent one. What, in connection with it, cannot be too often pointed out, is the fact that the annual amount of rainfall in a large part of the colony would be quite sufficient for irrigating the fertile soils, if all would be retained. As it is at present, many districts of the colony experience, during the larger part of the year, a very severe want of

water, and if suddenly excessive rains set in, they do much damage, because the water carries down to the sea the finest and best parts of the arable soil. What we want, therefore, in general, is a more equal distribution of the rain over the whole year. Tree-planting has been rightly recommended as a remedy, although some object on the ground that, trees evaporate the moisture more rapidly than the barren land. This is true, but the air is thus rendered moist, and will not exert the drying effect which it has when it has passed only over hot and barren uncultivated soil, because land well covered with vegetation is able to absorb, during rainy weather, much more moisture than the barren land, and that moisture is then, in dry seasons, slowly given off by the soil. They generally say that, Government would have to take up the water question, as the individual farmer cannot do it. This is quite right as to the carrying out of certain large irrigation schemes; but is it not much more worthy of the free man to help himself, as far as ever he possibly can than to wait for the assistance of Government? Could not many a tree be planted, many a dam be made by the farmers themselves? And what the individual farmer cannot do, companies, and societies formed by those who have a common interest in some irrigation work, are able to effectuate, as is done with many agricultural difficulties in other countries.

With regard to another difficulty, to which I would like to draw your attention for a moment: the Cape farmer is certainly in a worse position than his European colleague, namely, with regard to the labour question. There is no doubt our labour is bad, and comparatively expensive, and before this is thoroughly remedied, we shall never be able to carry through a rational system of agriculture as it is prevalent in Europe. But the farmers can easily guard themselves, to a very great extent, against both of these evils by forming a large Union, the members of which pledge themselves not to pay wages beyond certain limits, nor to give their servants more than a certain moderate amount of wine or brandy. Any member not keeping these regulations should have to pay a fine, which could go to the funds of the Union, or be used for supporting agriculture in general. It is a very common way, especially of the farmers in the Western Province, to get rid of their bad wine and Cape smoke by paying the labourers partially, in the form of these drinks; and there is no doubt that, the bad quality of our labour is, chiefly, due to the moral and physical deterioration of the coloured labourers, in consequence of the

excessive amount of highly alcoholized wine and brandy, which they receive whilst at work. The mania for drinking, the worst property of the South African labourer, is thus systematically fostered. On many wine-farms the labourer, almost the whole day, is kept in a slight state of intoxication, in order to get, quantitatively, as much work out of him as possible. As early as six o'clock in the morning the first dose is given; and so it goes on at intervals till sunset. It would certainly be much more to the benefit not only of the labourer, but at the same time also of the farmer, if a somewhat substantial soup made of flour, barley or oatmeal were given at least as the first meal in the morning. Our farmers should remember that the European agriculturists have not got their stock of good labourers by giving them much and bad alcoholic drink, but by carefully attending to their physical needs, and by endeavouring to raise their moral character as much as possible. The ministers of the Dutch Reformed Church, could do much more than anybody else towards removing the mentioned difficulty, and though some show sufficient personal courage in this matter, it is certainly not done so generally as one might wish in the interest of the farmer as well as of his labourers. I quite admit that, here and there, farmers have tried to oppose that dreadful habit, but in general not with much success, because the labourers simply run away. What we want is a united action throughout the whole colony at one and the same time, for the single farmer is more or less powerless in the face of an evil that has become so deeply rooted in our social system.

I have made use of this opportunity to say a few words about these points, as they certainly belong to the most important questions to be solved by the agriculturists of our country, and because they will have, also, to be discussed with the young farmer in the Agricultural College. He must be taught how to use an agricultural machine without spoiling or ruining the same: should he not also be taught to use that machine for whose physical and moral well-being he is not merely responsible to his purse—viz., his labourer?

Unfortunately I have felt it my duty to-day, to give vent to some unpleasant truths; but I have only done so in a spirit of love for our country and its inhabitants. Besides, it is not unknown to you that it is expected of Germans in particular always to tell the truth.

Much has lately been said, again, about the riches of this country in gold and diamonds; but, our chief resource will always remain in agriculture; and if the several branches of

agriculture are in a depressed condition, we shall suffer, every one of us, even the men of letters and the mathematicians, who are just now so much opposed to the study of science. But there is only *one* way by which the agricultural resources can be developed, and that is by the application of knowledge to the circumstances of the country; and this knowledge is *the* specific knowledge which our young men can obtain only in a properly conducted Agricultural College. Enough unsuccessful steps have been made towards the establishment of agricultural schools and colleges; let us now all combine to make one more attempt, one which must be successful, if we are in earnest; and, gentlemen, I can assure you that no greater good can be done to the whole colony, by this Exhibition which we all love alike, than by the establishment of an agricultural school as the outcome of a movement which has been started to-day.

V.

THE PRINCIPLES OF AGRICULTURAL SCIENCE:

HOW FAR SUCH A SUBJECT CAN BE TAUGHT IN THE ORDINARY SCHOOL COURSE, AND IN WHAT MANNER; WITH A SPECIMEN OF A SERIES OF PRACTICAL LESSONS OF A SIMPLE CHARACTER.

THE PRIZE ESSAY, FOR WHICH THE GOLD MEDAL WAS AWARDED TO

JAMES WILLIAM STROUD, M.D., *Port Elizabeth.*

ESSAY I.

(1.) The following papers are written by one who lays no claim to be an agriculturist in the strict sense of the term; but as his earlier years were passed in the midst of active husbandry, and a large part of his later life was spent in connection with amateur model farming, he is at heart, an agriculturist. In addition to this a portion of the technical studies of the writer has been, for some years, so steadily directed to matters which form the substance of the following essays, as to entitle him, he believes, to speak on the "Principles" of Agriculture with some confidence.

(2.) His object will be to refer as briefly as possible to some of the main "principles" on the *knowledge* of which the successful cultivation of the soil depends, without prescribing any other than the broadest rules of "practice," and at the same time to point out by what methods such knowledge can be best inculcated. Before doing so he will, by way of introduction, endeavour to recount some facts that, during the past fourteen years, have come under his observation in connection with "Colonial farming," and that seem to call for reformation, and if at times the same points are reiterated, it must be considered due to their importance, Repetition being, it is believed, the quintessence of Instruction.

(3.) That the drawbacks to successful husbandry in this country are not inconsiderable, physically speaking, can scarcely be denied, though they are certainly not such as are insurmountable, as has been already abundantly proven; and it must be acknowledged by any qualified observer,

that the resources both of soil and climate are very many and very great, and that they simply call for intelligent and well-directed energy, and perhaps a better system of land-holding, say of from three to six hundred acres per man, to make them available and remunerative.

(4.) But for the antiquated, non-progressive method of so-called farming in this country, which began in the most primitive manner and has continued more or less primitive up to this hour; which has learnt but little from experience and is content with what can be got from the stock without trouble, or the ground without labour, disregarding the real welfare of the sheep, or the future of the soil; growling anon at the severity of the droughts, though hourly fostered by a lavish onslaught on the wood-lands; and crediting these droughts, at all times, with the backward condition of the country, even though gold flowed over it in streams from the feathers of the ostrich;—but for this haphazard farming hitherto practised, doubtless through want of better training—a farming which, as a rule, trusts to "extent of surface," and expects Nature to do everything, and man nothing; that regards the soil as an inexhaustible reservoir from which one has but to draw at will; that forgets the dignity of labour for idle pursuits, and the stubborn fact that man must fertilize the soil with the sweat of his own brow;—but for this, despite of the numerous drawbacks, the commerce of the country might have long ago flourished.

(5.) Every commercial resource of the country seems at the present moment (Nov. 1885) declining. Flocks and herds are dwindling and deteriorating through utter ignorance of how to breed and how to feed them, and their produce is depreciating in consequence, as well as through lack of industry and attention. Grain—the staff of life, and grass-cultivation—the stand-by of cattle, are regarded by the many as follies and unremunerative; the production of root-crops as food for stock, or of ensilage, though now and then talked of, are at a discount. In a word, all the useful and essential elements of life, both for man and beast, are but imperfectly and spasmodically supplied. The natural capital of the soil, instead of being turned to the best possible interest, BY CULTIVATING THOROUGHLY AND ASSIDUOUSLY AS MUCH ONLY AS CAN BE PROPERLY MANAGED, and improving and sustaining its energy by suitable means, has been recklessly expended in one particular direction and ignorantly frittered away by gross mismanagement, and an easy-going improvidence. Such is the indurated condition of affairs that a system of husbandry on intelligent

and more scientific principles, and generally practised, can alone hope by lapse of time to redeem the past. Without such reformation the country can never progress.

(6.) If we confine our attention to the pasturage of the country, we shall find that a condition of deterioration has been long going on, from causes which were within the power of the farmer to control. A heedless waste of fine grazing ground has resulted from "overstocking" without replenishing the soil; and again, from an utter neglect of all attempts at economy of the soil's resources, by what may be termed "RESERVE," which would give some opportunity to the struggling veldt to recruit itself, and put forth fresh energy; or by THE FOLDING OF SHEEP AT NIGHT on various portions of the farm, to secure here and there an oasis, or green spot of manured land, and by persisting in this, till the whole is manured, and vegetation receives new life.

(7.) It should be thoroughly well known that the animal and vegetable kingdoms, being mutually dependent, re-act on each other, and that both are equally linked to the soil. [*Essay II.* (*a*).]* Each plant that furnishes food, draws from the ground such mineral elements, phosphorus, sulphur, potash, lime, &c., as are essential to its existence, and the quality of its vegetation depends on the material of this description ready at hand for its support. [*Essay II.* (*b*).]

(8.) Each animal—ox, sheep, goat, or ostrich—selects its own proper food in variety, a mixed herbage, best adapted to the building up of healthy tissue, flesh and blood, and the furnishing it, by transmutation in its animal mechanism, with that skin-appendage that distinguishes it from its fellows, whether it be wool, hair or feathers. Of such plant-food in variety for the animal, containing all the necessary elements of life, mineral included, and *palatable to its taste*, there must be an adequate supply to promote and sustain its healthy condition. [*Essay II.* (*m*) (*q*).]

(9.) On the other hand, for the permanent welfare of the plant, and by consequence, of the animal, certain elements of plant-food, and these in sufficiency (and ten are mineral), must either be present in the soil or be again given back by the animal in compensation to the soil in the form of "droppings" which result from the chemical processes of life. In the absence from the soil of these elements, or their equivalents in the shape of artificial manure [*Essay II.* (*d*) (*g*)], the

* The reference here and in succeeding paragraphs is to sections in the accompanying Essay on "Agricultural Science and its application to the conditions of the Colony."

vigour of the plant must flag and its stamina-producing qualities must fall off. This change the constitution of the animal soon feels, and its vitality gradually and inexorably suffers. Food, Food, Food, is the incessant demand of all life, both plant and animal, and of the requisite character and quality,—an insufficiency is death. [*Essay II.* (*q*).]

(10.) Unless a proper supply of such food is forthcoming from the soil, the nature of the plant is dwarfed, and the animal in consequence, virtually starved, cannot meet the demands that are constantly made on its organization, in the case of the sheep, in the furnishing of wool, and when its strength is further drawn on, in the fallacious system of twice-a-year or too early shearing and other malpractices [*Essay II.* (*q*)], its vitality is at once impaired, and it falls a prey to devitalizing parasites, or becomes a battening ground for the scab-insect, and an easy victim to *disease in any form.*

(11.) This is the reaction of the veldt against the consumer, and it is this unfairly tilting of that natural adjustment which should ever exist between all life and the soil; the upsetting of a delicate balance, through a short-sighted system of farming, to be presently further referred to, that has been sapping the real resources of the country, and checking its commercial advancement.

(12.) To remedy the evil is to pay back to the soil its honest due—that which has been simply robbed and not borrowed from it; to give it opportunity also to recover itself, and with it the food-plant.

Nothing but a rigid economy of the earth's spontaneous produce (i) *by diminishing the number of consumers, or* (ii) *by allowing certain portions of land to lie fallow and undisturbed, fencing them in to be grazed over only by rotation or* (iii) *better still, establishing movable sheep-folds, so as to manure the soil and then give it rest, or* (iv) *top-dressing such enclosures occasionally with guano or some light manure, ashes, &c., and sowing grass, lupine or other pasture seeds, well bushing them in* ;—nothing but these methods, or something equivalent, can restore to the pasture its original capabilities.

(13.) It cannot be too often repeated—that "the plant that sustains, must be itself sustained," *must* have reasonable attention, and a sufficiency of nutritive material in the soil, besides what it gathers from the air [*Essay II.* (*b*) (*c*)], in order that the animal that feeds on it may attain a healthy condition, and no animal can exhibit this without a sufficiency. True husbandry, moreover, does not consist in getting even

a sufficiency from the soil, but is ever seeking to obtain more, by improving its growing capabilities. [*Essay II.* (*m*).]

(14.) "OVERSTOCKING," which means overdrawing on the Bank of Nature, a fatal error, has been one of a long series of causes of manifold evils. It has occasioned during many a *lustrum* not only the cropping off year after year close to the ground, but the fouling, deteriorating, and finally the choking out the struggling energies of the coveted herbage.

(15.) In the constant to-and-fro movement of legions of sheep between kraal and pasture, plants valuable as food or of tonic properties have been crushed out of existence, and place has been given to hard, useless, and often poisonous vegetation which no effort has been made by the farmer to destroy or even check by uprooting or otherwise preventing its seeding. Beside this, the parent soil has by the time-honoured system of kraaling been flagrantly robbed of its natural due, the dung and urine of the animal it has fed, and this has been suffered to accumulate in tons and to be worse than wasted at the pest-heap of the wool-degrading, scab-infested kraal.

Had this ordure been naturally distributed, night and day, over the hungry land, and further supplemented by artificial aids and a little industry, it would have brought about a change in the character and growth of its vegetation; the better class of plant would have flourished to the disappearance of sour and worthless weeds, by which is meant useless vegetation, which is everywhere indicative of poverty, and sad evidence of want of attention.

(16.) Furthermore the evil of overstocking has been aggravated in some quarters by the vice of "GRASS-BURNING," which not only further prevents the wholesome and frequently tonic herb from reproducing its kind, but gives the best possible chance to the noxious weed to choke out its more tender, useful and struggling companion.

(17.) From the sheep-tracks moreover, further damage has accrued to the veldt. When the rain pours down as it does in this country on the dry and parched land, it is of little use unless it penetrates deep, but it scarcely wets the baked surface. On the contrary, it seeks the level of the deep-worn sheep paths that intersect the veldt as with a net-work, flows along them and down the slopes, waxing stronger as it goes, sweeping away from bush and herb their natural support, and washing into the swollen river, and thence probably into the sea, tons of the best soil the country affords.

(18.) To remedy this longstanding evil, the skill and ingenuity of man must be brought to bear, and not a little of his industry. Fencing, top-dressing by sheep-folding or artificial manure, and seeding where practicable, would abundantly help, as well as the periodic fallowing of a large portion of the farm, in order that wholesome vegetation may assert itself and fill up the voids.

(19.) Thus it is, however, that the indispensable food-plant having no rest to recruit itself,—robbed of the soil by the rain-torrent, and by the farmer without compunction or compensation of its natural desert, the ordure of the stock it feeds, which instead of being given to the soil, is recklessly wasted or dissipated in smoke;—eaten down, burnt or crushed out in its efforts to live, and trespassed upon by the harsher weed and coarse sour-grass which grow apace and alone flourish and seed,—succumbs gradually to its inevitable fate, and in its fall sounds the knell of the jaded, ill-fed, ill-fleeced animal it has struggled hard, as it were, to support, which looks dumbly and in vain to man for a substitute.

(20.) Under such adverse circumstances, what marvel that a steady change for the worse has been gradually creeping over large tracts of the once finest grazing ground in the colony?

Sheep in some quarters and horses, too, under the *régime* referred to, have already virtually died out, the pasture, finally, either not suiting the flock, or the animals the pasture. Had they been left to themselves to wander where they would day and night, with no human interference, Nature by her compensatory processes would have struck a correct balance and the soil have promptly and efficiently responded to the wants of fewer occupiers; but this lesson of Nature has yet to be learnt.

(21.) On the other hand, had the sheep, under reasonable attention on the part of their owners, been folded now here now there on artificial food [*Essay II.* (*q*)] during sickly or inclement seasons, and supplied daily with fresh litter, and kept *dry, clean* and *warm*, the sheep which are by nature manufacturers of manure of the finest and most rapidly-acting quality, would have turned the scale, and the desolate state of the veldt would not now be a subject of comment.

(22.) Under a system, therefore, of radically-false economy, tritely expressed as "in at the spigot and out at the bung," which has for long years been prevailing, nothing could be clearer than that a time was bound to come, when the pasturage would be exhausted or deterio-

rated, and the stock compelled to subsist on the scantiest nourishment—indeed to starve for want of suitable provision, at seasons when food was most needed. It is not extent of surface, but suitable food thereon, that enables the animal by storing up fat, or by the growth of fleece, to counteract sudden changes of temperature, and prevailing influences of cold and wet, which together mean Disease with all its brood, and Death. It is food that means carcase or wool, or both, and food *must* be provided, or sheep and cattle-breeding on any principles must, as a paying business, be discarded. [*Essay II* (*m*).]

(23.) But to aid in mitigating the evils referred to, neither substantial sheds, wholesome food nor comfortable hurdling [*Essay II.* (*q*).] have in the smallest degree hitherto formed part of an improvident and happy-go-lucky system. Such as these, however, are necessary provisions, where systematic farming is practised; and such, moreover, in a country like this, where by the ruthless dismantling of forests the rainfall is rendered more and more uncertain, is the providing against a scarcity of water a matter of necessity, as well for the soil in which the treasure lies, as for the flocks and herds themselves,—and this by the sinking of wells, wherever possible, and the taking out of water, wherever practicable, near the sources of rivers, to which we shall presently advert. [*Essay II.* (*j*) (*k*).] Where, moreover, fertility of soil and a supply of water are to be had together, there, by means of efficient windmills and orthodox irrigation, to take every advantage of the same, in the practice of genuine agriculture, on legitimate principles; and so in this country, by incessant PERENNIAL CULTIVATION, raise cereals in abundance, mealies, forage and fodder of every description, hay for storing, and root-crops in variety, resorting also to ensilage when feasible, against a time of drought or scarcity. In all seasons there would thus be abundance: stock of every kind would be kept in sound health and good condition, vigorous for reproduction, and useful for the quantity and quality of their marketable products.

(24.) On these principles, to be more fully detailed presently, the farming interest would thrive, though the actual percentage realized might *be at first but small to those who expect impossibilities*: railways would be cheapened and supported: money kept within the colony: the whole community, so dependent on the progress of husbandry, would prosper, and the revenue of the country increase.

(25.) "Hard stockmaster and bad farmer" have ever

been convertible terms. The welfare of his stock is the farmer's welfare. It is a truism that food to the animal means work and warmth, muscle and fat, wool and hair; and that these, in animal dynamics, are also convertible terms, correlated in the economy of trade with the particular expression, "money."

(26.) Maybe the writer will be considered rather severe against the farmers of the country, as if all were equally apathetic, indolent and indifferent to progress. Many will, no doubt, exclaim: But where is the capital? With capital all the rest would follow. But a farm is capital; ever so little stock is capital; industry is capital; and these together should make an interested man, of limited desires, specially happy, if not quite independent. Farms have already paid enormous interest, or have been "eaten up"; and industry has been either "misdirected" or not always "at hand." There never was a country, be it again said, that would not support its cultivators, provided they were willing to labour. Happily there are men amongst us, worthy examples, on whom the name of Farmer is most deservedly bestowed, whose enterprise has proven them worthy of all honour, who do till and irrigate the soil wisely, and manage their flocks and herds with discretion. Would that the country swarmed with them!

(27.) By way of remedy to a multitude of evils, some of which have been pointedly alluded to, while others are left in abeyance, the advantages of fencing and the alternate fertilizing of enclosed pasture-lands can scarcely be overrated. The veldt, no longer worn into ruts by the incessant to-and-fro tramping and perpetual roaming of the flock, receives their natural waste, retains the bounteous rainfall; and suffered to rest awhile and recruit itself, now in this place, now in that, steadily improves; the flock, always restricted in number to the sustaining power of the veldt, and divided into lots according to age, that the stronger may not eat up the food needed by the weaker; relieved from unnecessary wear and tear, grazing early and lying in the open night and day, freed entirely from the pernicious kraal; sheltered by Nature's shields of tree and bush raised for their comfort [*Essay II.* (*f*)], amidst excellent pasture, or protected from cold and wet by suitable sheds and supplied with properly selected food,—grow cleaner, plumper, healthier and better clad, for their wool is left to mature. Fewer herdsmen are needed; and contagious diseases are checked; risks run from wild animals are under

control; and last, not least, a safeguard is secured against cattle lifting and stock-stealing by the joint action of those most interested.

(28.) It is not to be supposed that the writer is blind to the many difficulties to be surmounted before the Millenium of sheep-farming and soil-cultivation supervenes, but he is fully aware of what patient industry can accomplish, and what awaits dogged perseverance. Years must pass, and suggestions must be tried and proved, before adopted, and then only one by one, and after a hard struggle, but one important element of success is achieved, and this in the matter of FENCING.

(29.) Fencing, however, is not much compared with what is needed, neither is the sub-division of the farm for alternate pasture, nor the hurdling or folding of sheep at night, nor the joint operation of farmers against wild animals and theft of stock. These are but small though essential parts of a system of husbandry which in treating only of "principles" can be but barely referred to here, but which, carried out in its entirety, can alone in these days of competition be attended with success. The soil must be turned to the very best account; the Earth, which is the mother of all living, must be stimulated and helped to reproduce, and to yield up her bounties in the greatest abundance both for man and beast. This is AGRICULTURE, and it is this that constitutes the very essence of the farmer's business and the actual wealth of a country.

(30.) What boots the perpetual discussion of Farmers' Associations if the principles and practice of good farming are not properly understood? The possession of a farm and stock and implements of husbandry does not itself make an agriculturist, but the knowledge of how these possessions may be turned to the most valuable account; and the doing it. This is to be assured only by a long and steady apprenticeship which every genuine agriculturist must serve, and this brings the writer to the main point of his essay.

(31.) An AGRICULTURIST of the true type should be frugal, but not penurious, patient but not indifferent, and above all things vigilant and self-reliant. He should make it his chief object to secure with the least outlay and with most advantage to the soil the best pasturage for his cattle, and to raise the largest crops of such food plants as are best adapted to his purpose: [*Essay II.* (*q*)] should rear and keep in good condition certain kinds of well-bred stock, such as are best suited to the character of his farm, for the sake of bone and sinew for work, milk and flesh for food,

or the products of their skin, in the form of wool, hair and feathers.

(32.) To this end he should make himself acquainted with the nature and chemical composition of the plants or crops to be raised, the character of the soil [*Essay II.* (*e*)] on which he has to raise them, as well as the kind of manure or artificial plant-food calculated to ensure their proper sustenance. [*Essay II.* (*m*).] He should study also the nature, composition and habits of the animals he rears, so that he may breed only the most suitable to his farm, and the most profitable [*Essay II.* (*o*)], and cultivate in abundance that class of food for his stock (and food for stock will have to be cultivated) best adapted for furnishing the various products he requires. [*Essay II.* (*q*).] Such knowledge as this is to be gained by no single experience, nor at once, but must be acquired gradually, and by appealing to the wisdom and multiplied experience of others. A trustworthy insight into organic and inorganic chemistry, the processes of chemical analysis, and their application to the soil, are altogether beyond the representative farmer of to-day, but they should surely be within reach of his son, or of the rising youth destined to agricultural pursuits, that the old paths may be for ever abandoned.

(33.) With this view the seeds of genuine agricultural knowledge should be drilled into the open furrows of the brains of children from their earliest school years, and by the simplest methods possible their minds be drawn out and strengthened. They should be taught, step by step, the ordinary processes of Nature, and their knowledge of Nature's laws should increase with their years, and mature with their growth. Such or similar teaching should, like reading and writing, constitute an integral part of school routine, to the exclusion of much of doubtful value, and be, drop by drop as it were, instilled. The growing boy will readily learn, under proper experimental teaching with blackboard, suitable diagrams, &c., such elementary matter in vegetable life as, how the plant grows; the uses of its root, stem, leaves, flowers and fruit [*Essay II.* (*e*)]; why it is dependent on air, light and moisture [*Essay II. b*) (*j*)]; and through judicious illustrations become acquainted with the various kinds of soils and their elementary constituents; why certain of these are best adapted to certain kinds of vegetation; how, if the same plants are continually drawing the food they need from such soils, the latter become exhausted, and no longer furnish the nutrition necessary [*Essay II.* (*h*)], while other plants will not only find adequate sus-

tenance in this same soil, but in their growth give back to it the very food which the previous crops had removed. [*Essay II.* (*i*).]

(34.) These and numerous kindred matters should not only be known by every farmer in the country, but be understood, and with them, too, the fact that to sell any product whatever of his farm without paying the soil a certain price in return, is to be actually selling his farm bit by bit.

(35.) Under this conviction the Essay that follows this has been written, and in it reference is made to those general principles which should govern the practice of agriculture everywhere, according to local conditions. Meanwhile, we venture to submit a "specimen of a practical lesson, of a simple character, given by an ordinary teacher to his class," which lesson, if space permitted, might be amplified and thoroughly elucidated in detail; and in *viva voce* instruction, and by searching questions, might be made exceedingly interesting and withal attractive, even to the dullest. The writer regrets that opportunity is wanting to prove this.

(36.) Specimen of a Series of Practical Lessons, of a simple character, on the Principles of Agricultural Science:

Teacher to his Pupils (*Loquitur*).

Lesson I.

The air which we all breathe but cannot see, is made up in part of a material [*Teacher explains that the word "material" is used, in the absence of a better one just now*] without which none of us could live. This unseen material is called OXYGEN. This oxygen is constantly meddling with all sorts of things, and whenever it does meddle with them it brings about a change in those things, which is called a *chemical change*. This kind of change I shall some day explain to you. The air contains also another substance which you cannot see, named NITROGEN, which is well mixed with the oxygen to prevent it from being so busy as it otherwise might be. But besides this mixture of oxygen and nitrogen, which forms the chief bulk of the air, there is another invisible substance in the air, which is known as CARBONIC ACID. This is chemically made up of two substances, one of which is, of course, meddlesome oxygen, which has combined with another, named CARBON. The lead of the pencil you see me write with, is one form of carbon, but directly oxygen lays hold of it, as it will under certain circumstances, it burns it into an invisible stuff, which is called carbonic acid, and is always found in very small quantities in the air we breathe.

The air around us, then, consists mainly of a *mixture* of two invisible substances or gases—oxygen and nitrogen,

amidst which a little carbonic acid gas finds its way. In this glass bottle I have some oxygen gas, which, as I have said, you cannot see, but which I will prove to you has an active and powerful existence. This, which I now show you, is a small piece of phosphorus. See, I place it into the oxygen bottle, and it at once takes fire. Well, without this oxygen the phosphorus would never burn, nor would this lighted candle here, -no, nor any other thing, and whenever it lays hold of anything it always burns it, though the burning may be so slow that we cannot detect it. This is called *combustion*.

This other glass vessel contains carbonic acid gas—which, you will soon notice, exists also. Look: I pour it over this lighted candle and it puts the flame out instantly. *(Teacher explains why.)*

Now these three gases are always at hand in the air about us, for they constitute the air,—that is, the air is made up of them,—with a certain quantity of invisible steam or WATERY VAPOUR amidst them. *(Teacher explains "vapour".)*

The soil of the earth, a little of which I have in my hand, is formed from the breaking down or crumbling of mighty rocks through long periods of time, by the constant action of wind and rain; and this material, reduced to powder, sand and gravel, and mixed with animal and vegetable waste, forms the various kinds of soils in which seeds begin to live, and plants and trees grow. I have some specimens of various kinds of soils in these bottles, and will tell you more about them in another lesson.

If a portion of soil, such as I have here—of a plant, say these leaves; of an animal, say a lock of wool—be exposed to fire, a part, as you will see, burns and disappears in smoke. It is the oxygen of the air which does this by combustion,—another part is left as ashes.

The part that burns is called the "organic" part, the part which is left as ashes is called the "inorganic" part. Soil, plant and animal, each one of them is made up of organic and inorganic materials.

The soil derives its organic part, the part that burns, from the waste animal and vegetable matter it contains, and its inorganic part from the powdered rocks from which it was formed.

The plant obtains its organic substance partly from the air, through its leaves, and partly from the waste animal and vegetable matter in the soil, by its roots; and its inorganic matter from the soil alone, also by its roots.

The organic and inorganic matter of the animal has its origin in the plants which it eats as its food, and plants draw these, as I have said, from the air and soil. That which exists in the animal, therefore, and in you and me, existed once in the earth and air, and it reaches us *through the vegetable food that is eaten.*

I shall one day show you how Nature's laws arrange it so that all this matter within us shall circulate back again to soil and air, so that not one atom or the smallest particle of anything is wasted or lost.

I have told you that the air contains two substances, *oxygen*

and *carbonic acid*, with another named *nitrogen*, and also *water*.

The plant before you has leaves, and on the surface of each leaf there are thousands of little mouths that are ever sucking in food from the air for the plant's support.

This food it finds in the *carbonic acid*. *It breathes in the carbonic acid*, separates it into oxygen and carbon, of which it is made up, *and breathes out the oxygen* with watery vapour. But where does the carbonic acid come from? From you and me and all animals. *We breathe in the oxygen* of the air which is given off fresh and pure by the plant's leaves and the millions of leaves on the trees, and we *breathe it out again* united with carbon, *as carbonic acid*, once more.

By means of the *oxygen*, *all animals* are enabled to *live*.

By means of the *carbon* the *plant is able to grow*. Of this carbon, blended with water, it builds itself up in *woody fibre*; and with this carbon, in combination with different other proportions of water, it manufactures within itself *starch*, *sugar*, *gum*, *gluten and oil*; and here are specimens of each one of these substances, made by the wonderful machinery of the plant.

These are the "organic" parts of the plant, which are dissipated in the air by fire, and become once more carbonic acid, nitrogen and water.

But besides these there is the "inorganic" part, which remains as ashes. These ashes are found to contain such substances as *phosphorus*, *sulphur*, *potash*, *lime*, specimens of which I here show you, and many others, which are called minerals of the soil; and though some of them exist in such quantities as to be almost imperceptible, that is, scarcely to be seen, yet *they are as necessary to the life and freshness of the plant when supped up by its roots, as is the carbonic acid which it breathes in from the air*. And this I shall some day prove to you by some plants which are trying to grow in water without them, or some one or other of them. I have much more to say to you about these "organic" and "inorganic" substances,—*all of which are found in the animal, just as in the plant*,—but before I go further, though I have gone over the ground to you already several times in this lesson, yet, in order that all may be clear to you, I must have everything, as we proceed, thoroughly understood.

(37.) Such facts as these referred to in the lesson, and countless others, may be readily instilled into the child's mind and made not only interesting, but the basis of a more intimate acquaintance with the higher physical and chemical relations existing between the plant and the animal and their surroundings.

(38.) All that concerns the chemistry of agriculture and its practical relations, so essential to perfect farming—for farming now-a-days must be earnest and measured by its power of competition—can be *thoroughly* learnt only in the laboratory, or by actual observation and experience either on model farms or in experimental agricultural schools, under

competent supervision, and the practical training of properly qualified masters.

(39.) Without *preparatory* teaching, such as we have essayed to point out, followed by such essential tutelage, the farmer of the future will, like the farmer of to-day, be simply groping in the dark, able at the best, and then only with difficulty, to make himself acquainted with the mere names of chemical substances, and their probable relative value as fertilizers.

(40.) But a better state of things is demanded, and the critical condition of the country at the present moment earnestly calls for wholesome reformation, which can certainly be effectually brought about by a system of rudimentary instruction in Government-endowed schools generally, and for final improvement of the student, by the establishment of practical institutions on the model of those existing in Germany, America and England.

VI.

AGRICULTURAL SCIENCE AND ITS APPLICATION TO THE CONDITIONS OF THE COLONY.

THE PRIZE ESSAY FOR WHICH THE COMMITTEE AWARDED THE GOLD MEDAL TO

JAMES WILLIAM STROUD, M.D., *Port Elizabeth.*

ESSAY II.

By way of sequel to what has been already said in the preceding paper, a few of the first principles of Agriculture are here broadly introduced, and first principles only, with which every agriculturist should be well acquainted; and these are stated, it is hoped, as clearly and succinctly as is compatible with the space allowed.

(*a.*) Plants and animals, in the economy of Nature, are, as it were, living self-regulating machines, that merely require proper care, and abundant food-supply, in order to turn out effectually a certain quantity of material useful to man: plants, for converting the non-living elements around them into their own vegetable matter, each according to its kind; animals, for turning such vegetable matter into flesh and blood like themselves. In this respect the animal is dependent on the plant for food, and the plant on the earth and air. The earth and air are fed by them both. All the elements that enter into the composition of the animal, existed once in the plant, and before this, in the soil and air. These the plant in growing searched out to build up into stem and leaves for the animal's use, and these the animal gives back to the soil and air either in its constant excretions or in its death, and thus furnishes anew fresh food for vegetation. In this way is circulated the material that forms, at separate periods, both animal, plant, and soil, A FIRST PRINCIPLE IN NATURE'S ECONOMY.

(*b.*) All that is round and about us, even we ourselves, are made up of a few distinct substances only, that have peculiar *likes*, so to speak, *dislikes* and *caprices*. In their likes they unite with each other and form new substasnce

entirely different from themselves. In their caprices they forsake their first loves and form fresh connections, entirely severing their former intimate union to form anew different material. These likes, dislikes and caprices constitute the combinations, decomposition and recombinations of CHEMISTRY.

The air around us is made up of a uniform mixture of gaseous and invisible elements, named OXYGEN and NITROGEN (an *element* being the simplest known form of substance), and with these are diffused CARBONIC ACID, AMMONIA and WATERY VAPOUR, which are *compound* substances, being made up of elementary substances peculiarly or rather "chemically" united. There is about four times as much nitrogen as oxygen in the air, and in every thousand parts of air we breathe, four parts are carbonic acid; there is always one part of ammonia, and in South Africa rather more, in a million parts of air; and of watery vapour a variable quantity. All these—oxygen, nitrogen, carbonic acid and ammonia, with vapour of water—are essential to the life, health and growth of plants, and out of these are formed their "organic" or destructible parts.

Oxygen is by far the most active and important of all the elementary or simple substances. By virtue of its properties, it is the great supporter of life in the breathing of animals, and of combustion in the act of burning. It enters into endless combinations with other substances. In such combination, that is, chemical union, with the element HYDROGEN, for example, it forms water, as a solvent most indispensable to all life; and with the element carbon, carbonic acid; and with the elements phosphorus, nitrogen and sulphur, phosphor*ic*, nitr*ic* and sulphur*ic* acid respectively. These acids, as is well-known, in their pure and free state are very corrosive, but in chemical combination with lime, soda, potash, &c., as they exist in the soil, become nitr*ates*, phosph*ates* and sulph*ates* of *soda*, &c., and not only harmless, but a food absolutely necessary to the existence both of plants and animals.

The other element of air, nitrogen, during thunder storms combines with oxygen and forms nitric acid and in combination with hydrogen, an elementary substance, forms "ammonia"—of infinite value to plants.

Carbonic acid is oxygen in union with carbon, which latter substance is an essential element of all living structures. These living structures all contain, besides carbon, hydrogen, oxygen and nitrogen, small and varying quantities of sulphur, phosphorus, lime and other minerals. Every product of

plant manufacture is found to contain carbon, as I have already said, and this carbon has its chief source in animal life. Animals, in breathing, take in oxygen from the air for life purposes, and throw it off, in combination with carbon from their own bodies in expiration, as carbonic acid. This carbonic acid, under the influence of sunlight, the green leaves of plants have the power of breaking up anew into "oxygen" and "carbon." The carbon is retained by the plant for numberless purposes, and pure oxygen is restored to the atmosphere for the further respiration of animals. The carbon of plants then is, by means of their leaves, derived for the most part from the carbonic acid of the air, which is *a storehouse practically inexhaustible.* The hydrogen and oxygen, which enter largely into their composition, are derived from water, and their indispensable nitrogen from air, and from the breaking up of ammonia (nitrogen and hydrogen) and setting free the hydrogen.

Out of these elements, carbon, oxygen, hydrogen and nitrogen, which make up together the air we breathe, the so-called "ORGANIC" portion of plants is formed by the intricate mechanism of life.

(*c.*) When plants are burned in the open air, this organic portion is dissipated and given back to the air, while certain inorganic elements remain as ashes. These ashes consist of the further elements *potash, soda, magnesia, lime, sulphur, phosphorus, chlorine, iron, manganese, iodine, bromine, fluorine* and probably minute quantities of other mineral substances. All these are borrowed from the soil only (which, unlike the air, is *not* an inexhaustible storehouse), and are supped up by the rootlets of plants, constituting their "INORGANIC" or mineral food.

As each and all of these latter substances, in more or less quantity, according to the nature of the plant (see tables) are absolutely essential to plant-growth, and the absence of the apparently least important, will assuredly influence its health, it is of vital concern that all soils to be productive should contain them. It is a matter of certainty *that the life-sustaining power of all plants is in direct ratio to the supply of certain mineral matters which their roots meet with in the soil.*

Where any one of them is wanting, or is beyond the reach of the active rootlets, good crops or abundant vegetation must not be expected. Where any one of them exists in small quantity, those plants which need a large supply will be stunted and poor, and those only that need but little of such substance, can flourish at all. When

many of these necessary ingredients are wanting, or where some exist too abundantly, as often happens, so as to poison the plant, such as too much chlorine and soda (common salt) or certain salts of iron, one per cent. being too much, the soil is naturally barren.

(*d.*) All SOILS are primarily due to the pulverization or reducing to powder of different rocks that form the crust of the earth, during long ages, by forces chemical and mechanical which are still in active operation. Their broken down material, modified by the growth of plants and the excretions and decay both of plants and animals, finally constitute the various kinds of soils. The chief mineral ingredients of a soil will naturally be the same as those of the rocks from the crumbling down of which the soil is formed. The *silica* or sandy element will predominate in light soils from the sandstone; the *calcareous* and marly, in those from the limestone; clay or stiff and heavy soils from a clayey formation in which the mineral *alumina* most abounds. Of these, *alumina* remains in the soil; *silica* accompanies the plant in its growth in such form as the glaze on the stalk of wheat and other cereals, and so also do the other mineral ingredients already referred to.

THE QUALITY OF ANY SOIL varies with the admixture of these soils respectively, the *cloyey*, the *sandy* and the *limy*. The three together constitute *loam*; if lime predominates, calcareous loam: if clay and lime prevail, calcareous clay, and so on. The smaller stones of a soil are not only useful to the soil, but frequently offer a good index of its formation, as they are the unpulverized fragments of the rocks from which the soil was derived. The BEST SOILS, therefore, are those from the *débris* of different strata, or beds of rocks, minutely broken up, and, by the action of wind and water, intimately blended together, as in the *alluvial* deposits in valleys. This natural admixture should be artificially imitated in any effort to improve the land, any particular ingredient being added which seems needed to render it productive, or an excess of any one qualified by the addition of any other: an excess of sand, for example, by clay or marl, or decaying vegetable matter; an excess of vegetable matter removed by burning, or by the addition of sand, clay or lime. On the same principle, marshes too, which contain much vegetable matter, should be drained and top-dressed with sand or clay, and where too much acid matter or salts of iron prevail, lime or chalk should be added.

It may happen that a soil apparently suited for a special

cultivation, or one indeed that has often proved so, fails to produce the expected crop. Why this is, can be answered only by a chemical analysis of the soil, to determine the ingredients wanting to make it productive. Add but these, whether they be "organic" or "inorganic," and vegetation springs up luxuriantly. In connection with this, it may be said that the chief mineral constituents of plants, especially phosphate of lime, together with nitrogen in quantity, on which the relative value of different manures depends, are met with in GUANO, which forms a cheap, portable, concentrated, and, with six times its weight of fine soil, a readily utilized manure, in a condition adapted to vegetation, especially cereals, root-crops and grass [*see table "guano"*]; and not in guano only, but in the contents of the kraal also, which, thoroughly moistened or *well* mixed with ordinary pulverized soil, and carted to the veldt, would either in this form, or burnt and used also as a top-dressing, produce, without doubt, an adequate return of nourishing vegetation.

(*e*.) Not only, however, is the fertility of the soil dependent upon the available quantity of plant-food it contains, organic and inorganic, but likewise on its POROSITY, that is, the free admission it offers to the air amidst its particles, the unobstructed passage it affords to the roots of plants as they extend themselves in search of sustenance,—the easy access also and egress of water, combined with a certain retentive power, which enables it to resist protracted drought, and admits of its fully appropriating the fertilizing elements that water holds in suspension.

Water holding in solution ammonia, potash, soluble phosphates and other salts, in its descent through the soil, is filtered of these substances, which at once combine with the earthy particles and are kept stored up till the rootlets of the plant make use of them. Clayey or stiff soils are the most active in this power of retention, sandy and gravelly being least so, so that whatever manure or artificial plant-food is added to such light soils must be furnished in less quantity and more frequently. On the other hand, such soils may be improved by admixture with clay. Clay gives substance to a soil and corresponding resistance to drought, its closeness of texture affords a strong hold to fibrous roots and is well adapted to tap-roots. It is invariably enriched by carbonic acid and mineral plant-food, potash, soda, oxide of iron, magnesia and lime.

Wherever LIME is, it is not only itself a plant-food, but acts also both mechanically and chemically. It renders stiff, heavy lands more easily worked, and where lime and

clay exist together there are found ready at hand nearly all the elements necessary for vegetation. Lime decomposes the silicates of sandy soils and makes them more consistent and compact. Where the soil is charged with sulphuric acid, lime neutralizes the acid, blending therewith and becoming sulphate of lime or gypsum, which is excellent food for vegetation. Lime acts also in decomposing vegetable mould or *humus*, when existing in the soil, by setting free carbonic acid, ammonia and water, all plant-food. It is for this reason that *lime should never be mixed with fermenting manure-heaps*, as the ammonia is then driven off and lost. Lime, indeed, by its chemical and mechanical properties, when judiciously applied in respect to time, place and quantity, renders the ground in every respect more moist, cool and mellow for the rootlets of plants to luxuriate in.

All food-plants show by their composition and habits the class of soil to which they are adapted, and it is expedient for the agriculturist not only to study the geology (soils, &c.) of his farm, but to make himself acquainted with the name and quality of the various useful herbs, grasses and bushes upon it, as on a correct knowledge only of the nutritious value of his pasture can he best arrange the grazing of his stock.

Speaking "typically" of soils, from their intrinsic qualities, *the heavier clays* are best for permanent pasture; *the lighter*, by reason of their plasticity and firmness of texture, are eminently adapted for corn and beans, and with proper manure, steady cultivation and good drainage, will readily furnish a succession of good crops: *Loamy soils* grow any crop, and *clayey loam* roots of the best quality: *Sandy loam* rye and barley especially, and green crops for cattle: *Light loamy soils* more or less gravelly are adapted to mealies, buckwheat, turnips and other green crops: *Calcareous soils* for tobacco, clover (excellent for cleaning new ground), vetches, lucerne, pease and other leguminous plants: *Deep alluvial soils* for tap-roots and almost any crops.

(*f.*) Whatever be the nature and quality of the soil, with respect to its organic and inorganic elements, it admits not of any doubt that in order to till it with profit, and improve and maintain its fertility, it should be constantly BROKEN UP, PLOUGHED, SUBSOIL-TRENCH-AND-CROSS-PLOUGHED, HARROWED and SCARIFIED. Labour, *unremitting* labour, must be employed to put the soil in goo' . The oftener the earth is turned over, and the

more the soil is pulverized, the oftener are fresh surfaces exposed to the air, and to the numerous influences that act upon and benefit the soil; and it would almost seem that the *power to imbibe moisture* thus diffused, was an important condition of soil-fertility.

To BEST FIT THE GROUND FOR SEED, *and to bring an abundant crop*, the great principle of action should be to *render it fine, moist, deep and clean. Constant stirring* of the soil,—*deep-ploughing to let in air and moisture; thorough manuring with organic refuse*, if necessary, *to render it mellow;* with suitable *under-drainage, to secure free circulation and absorption of rainfall*, are not only *essential to permanent fertility*, but potent *safeguards against drought*; for when rain does come it percolates through a porous stratum, *every particle* of which *becomes a tiny reservoir of moisture. A more equable temperature is at once established in the surrounding air*, which not only *becomes more moist*, but has a tendency to increase the rainfall, and this more especially *in the neighbourhood of trees, the planting of which* in a dry, rich, mellow, sweet and friable soil, *claims the first attention* of the progressive husbandman. The broadcast yet systematic planting of trees, it is maintained, would of itself raise the country from a condition of desert to a paradise of plenty, and the Government would act wisely in encouraging it.

(*g.*) MANURE is plant-food added to the soil, to make good its deficiency in useful materials for plant-life, or to increase its natural store. All vegetable matter, including seaweed, may be spread over the ground, more especially on light sandy soils, and ploughed in as manure. Or it may be mixed with earth, lime or sand, and suffered to decay as "vegetable compost," which may be mixed with any soil. All animal waste, whether in bone or ordure, mixed with vegetable compost, constitute a valuable and reliable manure, ploughed into the soil. Crushed bones, for the phosphorus and lime they contain, form a priceless manure, though countless tons are scattered wholesale over the country and are disregarded. Dung from the sheep, from its very nature most rapid of action; dung from the farm-yard, the stable, byre and stye—though each differs from the other in value as a manure—contains all the mineral constituents of plants, as well as nitrogen, in more or less quantity, and if ploughed in, it so dissolves and helps to pulverize the earth, as to render the stiffest soils perfectly fit for the growth and nourishment of plants. The dung from fattening stock is always the richest, that of full-grown animals is always

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richer than from young animals, for the reason that the former have only to supply daily waste, the superfluity being thrown off, while the latter have to increase in size in addition to supplying daily waste; and this applies eminently to bone-substance and nerve-matter (lime and phosphorus), so that less valuable material is given off in their droppings.

"Every field," says Baron Liebig, "contains a *maximum* of one or several nutritive substances and a *minimum* of one or several nutritive substances. It is by the *minimum* that the crops are governed, be it lime, potash, nitrogen, phosphoric acid, magnesia or any other mineral constituent." THE WHOLE ART OF MANURING consists in adding the *needed constituent* in the right quantity, at the right time, and in such a way that it be evenly distributed.

(*h*.) The FAILURE OF CROPS or of wholesome pasturage may be due to *a deficiency of organic matter* in the soil, which by its decomposition would furnish it with a more abundant supply of *carbonic acid and ammonia*; and 2nd, to a *falling off in the supply of the inorganic or mineral essentials*—phosphorus, potash, magnesia, lime, &c.

FALLOWING is a principle of husbandry which has been too rarely practised in this country. It is allowing the pasture in portions to rest every other year, or at regular intervals, though still used for the *folding* of sheep, and so recover itself, after being turned to account in the *feeding* of sheep and cattle. It then becomes again rich with vegetation through the action of air and moisture, changes of temperature and other fertilizing causes. Unmolested, the ground lays in a stock of manure from the air and the rain in the form of ammonia and carbonic acid, sulphates, &c., and by the very slow but constant decay of insoluble matter in the soil, fresh mineral food is gradually formed in the soil, and vegetation receives new life.

In reference to cultivated lands, while there can be no doubt that a succession of the same or similar crops may year after year for a number of years be reaped off the same ground under proper cultivation and suitable manuring, yet inasmuch as THE SAME CROPS REMOVE ALWAYS THE SAME CONSTITUENTS, LEAVING OTHERS UNTOUCHED, a succession of different crops is needed to relieve the drain of some constituents, and to utilize others. The force of this may be seen from the fact that turnips remove five times, beans three times, oats twice as much potash, as wheat. Oats need just five times as much silica as wheat, and barley twenty-six times as much as an equivalent

wheat crop. Tobacco speedily robs the soil of lime and potash; root crops constantly carry off phosphoric acid and potash. Grain crops remove phosphoric acid, potash and magnesia, and all plants that furnish food for animals must withdraw heavy quantities of phosphoric acid and potash. One-twentieth of the weight of a single bullock is mineral matter, which may be reckoned as a loss to the soil of over 8½ lbs. of priceless, exhaustible material; while the loss to the soil by a crop of wheat is more than double this.

WHATEVER, THEREFORE, IS REMOVED FROM THE SOIL, whether in the form of crops, or of flesh and bone, milk, wool, hair or feathers, *draws upon its fertilizing elements*, and IF THE DRAIN IS PERSISTED IN without repayment of the same, in the shape of artificial manure, in proper quantity and at proper times, and properly distributed, *the soil becomes finally exhausted, and refuses to produce the vegetation needed.* By such exhausting of the soil, crops will soon not pay even for labour, and without some attention to pastureland it is vain to hope for strong and healthy stock. The soil, indeed, may at first be ever so fertile, and may for a long time resist bad treatment, yet, sooner or later, it must be impoverished, and THE FARMER WHO HAS PERSISTENTLY SOLD ALL HIS CROPS, forage, wheat or barley, or the produce of his pasture, without returning what the crops have removed, or the stock turned to his advantage in the shape of carcase, wool, hair or feathers, HAS BEEN GRADUALLY DISPOSING OF HIS FARM PIECEMEAL, and will eventually find HIMSELF "SOLD."

(*i.*) When we regard the countless and multiform products of the vegetable world, all differing, more or less intimately in their composition, and sometimes inappreciably through lack of minute detection of mineral ingredients, the necessity will be evident that the soil should be at all times well provided with those substances, a stint in any one of which naturally affects the quality of the vegetable product. The roots of all plants in their progress through the soil seem to exercise a choice in the absorption of such mineral matter as their special nature requires, and if this drawing goes on year by year, more quickly than the ingredients are supplied, a time must necessarily come when these substances cease to be furnished in requisite quantity. The farmer should study, therefore, *that order of* SUCCESSION *in his crops which will admit of the greatest interval between the cultivation of plants of a similar nature,* in order that the soil may have an opportunity of regaining the material it has given up,

before it is called upon again for a similar supply. And he, furthermore, should take care that plants grown for seed should, as a rule, alternate with those grown for roots and leaves. Besides, it seems more than probable that every plant gives out, in its growth, a peculiar excretion noxious to itself and to all members of its kind, but conducive to the growth of others, and until such *excretory matter* is removed by these latter or by gradual decomposition, the same crop cannot again flourish to advantage.

In growing fruit trees—the vine, to wit—the habit is to plant in rows, and allot a certain space to each. They yield their excretions to the soil, but no other plant or tree is at hand, as was the elm of old, to utilize the waste while supporting the vigorous shoots and fostering the extending roots. Is this possibly a modern mistake and to the disadvantage of the vine? Might not some *subsidiary* plant be grown to pierce with its roots the earth and loosen its texture for the good of the vine, throwing off its own *excreta* for the vine's behoof, a poisonous safeguard against devastating aphids? *Apropos* of these last, the writer would suggest, as a vine-dressing experiment, a compost of decomposed cabbage leaves, which abound in *carbo-sulphide*.

Leguminous plants, beans, pulse, clover, as well as root-crops and potatoes, leave behind in the soil an abundance of nitrogen in the form of roots and leaves, which in their decay furnish excellent food for a succeeding wheat-crop. On the above and similar facts is founded the system of ROTATION OF CROPS, which, modified according to the leading features of the place, aspect, temperature and character of soil, divides the labour of the husbandman systematically over the whole year, and wearies out the determined endurance of even the most patient and persistent weed, while food for man and beast grows apace and risks and loss are reduced to a minimum.

(*j.*) While, however, the natural texture, mechanical condition and chemical properties of the soil, or the added manure, may be eminently adapted to the nature of the crops, and the farming perfect, still, where all these requisites are present, and MOISTURE is wanting, it needs scarcely be said that the hopes of the agriculturist are vain. Drought is ruin; without water, seeds perish, growth is arrested, springs dry up, and the veldt is parched. The absence of vegetation impoverishes and dwarfs the stock, lowers their vitality and indirectly courts disease, which leads to death and decimation. It behoves, therefore, THE PROVIDENT HUSBANDMAN to spare no pains nor any investment

he can possibly afford, in order to obtain a fair supply of water; and the skilful and assiduous farmer, who alone increases the fertility of the land, *will never rest until he has got it.*

To support vegetation at all, it is calculated that any soil must contain ten per cent. at least of water. Seeds in order to germinate require a very much larger quantity, and all vegetation in process of growth must have an abundant supply. From 75 to 95 per cent. of water enters into the composition of most vegetable products. Besides this, every particle of nutriment, in order to be supped up by the rootlets of plants, must be in a state of solution in water. Evaporation, moreover, is constantly going on from the leaves, and when this is in excess of the quantity absorbed, the plant droops and dies of drought. In a climate like that of South Africa, where the local supply of water—through irregular distribution or deficiency of rainfall, or through other causes due to the nature of the country or to the farmer himself—is found inadequate to the requirements of the agriculturist, every effort should be made to turn to the best account what Nature does afford, whether in rainfall, river or spring; and to tempt her also to furnish still more, by the constant planting of trees; and be it repeated, no single thing would, we believe, conduce more to the future prosperity of the country than this matter of THE PLANTING OF TREES.

In central Australia, once a parched wilderness, and deemed uninhabitable, millions of acres now of fertile country testify to the energy of its people, and the value of artesian wells and catch-reservoirs. In this country we venture to say that there are few farms on which there are no actual springs; not one, perhaps, where rushes or sedges or water-plants do not somewhere or other indicate water beneath the surface; and certainly none that are not some time or other deluged by a heavy downpour of rain; added to which, there are tens of thousands of morgen close to rivers, that await only the kindly service of the plough.

All artificial supplies of water are due primarily to rainfall, and must be drawn either from surface-drainage or subterranean stores, and a knowledge of the geological conditions of the country can alone decide which of the two sources would be most utilizable. The energy and ingenuity of the farmer should be ceaselessly exercised in getting and preserving and economizing the priceless fluid, in accordance with the nature of the place; either in damming up kloofs or gulleys, to prevent its too rapid escape; or

leading out water from rivers when practicable, or in making permanent reservoirs by the aid of steam excavators. Better still, he may have the advantage of perennial springs, or the opportunity of sinking tube-wells, and conducting the water therefrom to such place or places as will admit of its being jetted by proper appliances, or, simpler still, led over a tract of soil so large that every drop will be duly absorbed. This latter is readily effected by pumping the water, by means of wind-power, either from springs or rivers or any available source, to the highest point of the lands to be watered, and thence allowing it to course in steady stream all over the surface in open gutters, with pits here and there, so arranged that the water shall run very slowly, and sink deep into the open soil, as it flows along, percolating through it and rising by capillary attraction, and so adding thereto both moisture and manure.

This watering of the earth artificially, as a substitute for rain, and to soften the soil, constitutes IRRIGATION, and its practice, in various modes, is as old as civilization itself. By irrigation, the husbandman is made independent of the seasons, and master of the rainfall. By it, early and rapid growth is stimulated and sustained, through agencies which water alone can bring to bear. It modifies the temperature of the soil, and introduces to it air and other gases, organic and mineral matter held by the water in suspension, and it washes out of the soil, where there is suitable drainage, any noxious salt that may have rendered it unproductive. Irrigation, however, and especially from wells, unless rationally practised, will have its drawbacks, by reason of the alternate soaking and drying of the land; and to be continuously successful, *it must always be accompanied by adequate tillage, suitable manuring and appropriate drainage. When water sinks* freely into the earth, *air necessarily follows*, and its oxygen brings about a slow but complete oxidation or chemical decomposition of whatever vegetable matter exists in the soil, and sets free, moreover, those substances therein which either furnish or prepare nourishment adapted to the young and growing plant.

(*k*) Still, however, as the more-than-necessary water *must* be allowed to escape, it will be readily seen that next in importance to the getting water on to the cultivated soil, is *the properly disposing of it, when it is there.* Where irrigation is demanded, there is DRAINAGE essential, and no essay on the Principles of Agriculture, however brief, would be complete without making reference to it. The principle involved in drainage, as here understood, is

not so much to get rid of the water brought to the surface as to *keep it moving* into and giving it a free passage through the body of the soil, so as to thoroughly *utilize the supply.* Where this is best accomplished, there is drainage most complete. Among the many practical advantages of good drainage, to be enumerated presently, may be mentioned the growing of a greater variety of crops earlier, more abundantly, and of better quality, and this naturally follows from what has been said concerning irrigation.

Without attempting to describe under what circumstances Irrigation and Drainage may be most "practically" carried out, it may be incidentally repeated, and repetition is the soul of teaching, that in the tillage of the land, EVERY PROVISION SHOULD BE MADE FOR THE PERCOLATION OF EVERY DROP OF WATER THAT COMES UPON THE SOIL, through a pervious and porous stratum of soil several feet thick, and its final escape by drains of such depth and frequency as particular circumstances dictate.

The principles of Irrigation and Drainage are well illustrated in the ordinary FLOWER-POT. The sides of the pot are porous like the soil itself, for the admission of air and moisture, and the soil within is friable and pervious. The water that is jetted over it, though pregnant with nutriment, may be either life or death to the plant. There is a small hole at the bottom of the pot. By this hole, the water—leaving in the earth its stimulating principles and the dissolved materials of nutriment ready for the plant's absorption—gradually *drains off*, and the plant flourishes. But for this outlet, the water would become *stagnant* and deprave the plant's nutrition. Added water would but increase the mischief, for the roots would then decay, and the plant perish.

What Drainage will do for the soil may be tritely summed up in the following aphorisms:—

It removes stagnant water from the surface
Removes surplus water from *under* the surface
Lengthens the seasons
Deepens the soil
Warms the soil
Equalizes its temperature during season of growth
Carries down soluble substances to the roots of plants
Prevents heaving out or freezing out
Prevents injury from drought
Improves the quantity and the quality of the crop
Increases the effects of manures
And prevents "rust" in wheat and "rot" in potatoes.

(*l.*) From the soil, its formation, the principles of its tillage, the rotation of crops, irrigation and drainage, to all which we have somewhat lengthily referred, let us pass to the plant and animal.

It is in the soil that PLANTS find their medium of support, firmly fixing themselves therein by their roots, according to the nature of their upward growth. *Roots* are but prolongations of the stem, and are of various forms, branching this way and that after the manner of and corresponding to the upper portion. The roots serve also the double purpose of throwing out *rootlets*, which, cork-screw like, penetrate into the soil, and with white open lips, or "spongioles," absorb liquid nourishment. This liquid, containing carbonic acid, ammonia and mineral matter, circulates upwards through the porous substance of the plant, and becomes exposed in the leaves to the surrounding air. The leaves are studded underneath with countless, active microscopic mouths, that suck in carbonic acid and ammonia from the air, and breathe out oxygen and moisture.

The nourishment imbibed by the rootlets, and the carbonic acid drawn in from the air, circulating together, steadily undergo chemical changes, the results of which are stored up in the plant, as substances of plant manufacture, viz., *woody fibre*, *gums*, *starch* and *sugar*. These differ from each other only in the quantity of "water" each contains in its composition.—(*See table III.*) Besides these there are numerous others, such as *oils*, *resins*, *balsams*, &c., the extraordinary number of which will show the importance of studying the nature both of plant and soil.

Every plant, the vine included, loves its own favourite climate, dry or moist, and its own peculiar soil to which it is best adapted, the more or less wet, the sandy or porous, the heavy or stiff, &c. Any change wrought in the condition of the soil alters the character and growth of the plant which thereafter springs up,—active tillage causing or encouraging a finer class of plant to flourish to the disappearance of the inferior. Every plant, moreover, has its own mode of growth, and draws its nourishment from the soil in its own peculiar way. Some, like pease or barley, search for their food in the upper layers of the soil, while beans and red clover strike deeper, the latter even choking out the enemies of the plough and preparing new land for active tillage. Such plants as these, then, of different habits, may in cultivation follow each other with advantage.

(*m.*) Plants furnish substances indispensable to ANIMALS, which, either directly or indirectly, derive their nourishment

from vegetation. These substances, like the soil-food of the plant itself, may be classed as "organic" and "inorganic." Of the organic some are *nitrogenous*, that is, they contain nitrogen,—such are gluten or albumen or casein. Others contain no nitrogen but *carbonaceous* or fatty matter only, as starch, sugar, gum, oil. A combination of these glutinous and fatty matters with "inorganic" compounds—phosphates, &c.—diluted with water, all existing in vegetation, constitute the ESSENTIAL MATERIAL OF ANIMAL LIFE. The proportions of glutinous matter in the plant compared with fatty matter vary with the kind of plant, and in the same plant also with difference of soil and climate. All kinds of corn, or cereals, contain gluten and fatty matter. Wheat contains the greatest quantity of gluten and the least of starch;—while oats and maize, linseed, sunflower and other oily seeds, specially contain fatty matter convertible into OILCAKE;—beans and peas most casein.

All plant products, as already said, contain "inorganic" or mineral elements, which are left as ash when the plant is burnt. Among these are potash, soda, lime and magnesia in combination with sulphur*ic*, nitr*ic* and phosphor*ic* acid, and so forming sulph*ates*, nitr*ates* and phosph*ates*, the last of which, the phosphates and nitrates, constitute the most valuable ingredients of the soil. These with other mineral substances, *essential to plant-life*, are *equally indispensable to* the life and health of *animals*, and are similarly found in their ashes.

PHOSPHORIC ACID especially enters very largely into the composition of certain animal tissues, notably of bone (*phosphate of lime*), 20 lbs. of bone containing as much phosphoric acid as 1,000 lbs. of wheat or oats; and not of bone only, but especially also of brain and nerve substance, which largely rules all the processes and issues of life, and is therefore constantly wasting and abundantly in demand. "The development," says Liebig, "of all plants and animals is directly proportionate to the quantity of *phosphates* supplied and taken up by them."

The waste of animal substance will be all the more evident when it is known that not a movement, however small, can be made by any animal, nor a sensation experienced, however insignificant, without a certain amount of waste of its body. This waste must be supplied, and especially nerve-waste.

The hydro-carbon (or carbon and hydrogen) products of the plant—STARCH, SUGAR, GUM and OIL—after undergoing digestion are burnt in the animal stove *through respiration*, and are thus *the great source of* WARMTH to the animal.

Their carbon unites with the oxygen of the air breathed in, and heat is the result. Carbonic acid is thrown off by the lungs, and diffused in the air, to become again part of the plant, through absorption by its *leaves.*

On the other hand, THE GLUTEN or nitrogen product of plants, which is nearly identical in composition with animal muscle, IS BUILT UP INTO BLOOD AND MUSCULAR TISSUE, and is constantly repairing the muscular waste of the animal machine, and this *waste.* for the constant circulation of matter, *is* automatically *thrown off in the form of dung and urine,* to become again part of the plant through absorption by its *roots.*

Where muscle or flesh is needed, or there is much wear and tear of the machine, there the food of the animal should contain most gluten.—(*See table I.*) Where more warmth-producing food is eaten than is actually needed, there the superfluous carbon and hydrogen of the starch, gum, sugar and oil accumulate as fat. In this consists the principle of FATTENING; the warmer the animal is kept, and the less it moves about, the less of its fat is consumed. As every inspiration burns up a small portion of oily substance, so every movement diminishes its store.

The products of animals, their HAIR, WOOL and FEATHERS, are the equivalents of food eaten.—(*See table.*) The better they are sustained with suitable food, and the less there is of wear and tear, the more is this evidenced in the covering they wear, both in quantity and quality.

On reviewing from this point the preceding observations, it will be seen that the skill and industry of the farmer will be plainly exhibited, and his PROSPERITY almost entirely involved, *in the methods he adopts of rapidly and effectually converting his green crops, roots and pasture into valuable stock, and the economic use he makes of their manure in the sustaining and further enriching of the soil.*

(*n.*) Of all foods the type is MILK, an *animal nourishment* prepared by the mechanism of the mother for her young, either directly or indirectly, from *vegetable food* produced out of the soil—an excellent instance, therefore, of the mutual dependence of soil, plant and animal. It contains within itself all the essential elements of nutrition, which are borrowed from the plant and animalized, viz., water. which forms four-fifths of every animal structure; curd, which is analogous to the nitrogenous gluten or casein of plants, and supplies muscle; butter, which gives fat to the body, and, with milk-sugar, supplies carbon for animal respiration and heat; and further, of certain mineral matters

held in solution, all furnished by the soil. Of ten gallons of milk, or say one hundred pounds of cow's milk, 4½ lbs. are curd, 3 fat, 4½ milk-sugar and ⅛ lb. mineral substances, viz., phosphates of lime and magnesia, chlorides of soda and potash, and other salts found in the blood of animals. When new milk is set aside, the lighter fat rises to the surface as cream, a little vinegar or rennet separates the curd from the remainder, and the sugar and mineral matters are dissolved in the whey. 100 lbs. of butter contain about 12 lbs. of water, 1 lb. of curd—which, by the way, tends to make it rancid—and the rest is fat.

Milk, *like every other animal product*, is affected in quantity and quality by the kind of food eaten. Quantity results from rich and juicy food, grass, green mealies, clover, turnips, &c., and the supplying much water as drink. Quality from drier food, oats, beans, &c., adding turnips, but giving little water. Rich butter results from oilcake or oily food, oats, mealies (crushed), barley, &c., with turnips. Cheese is increased by adding to the food beans and peas which contain a substance—casein—nearly identical with the curd of milk. Ten pounds of milk make one pound of pressed cheese, but the best cheese is that which contains most fat.

From this brief reference to milk it will be evident that its essential elements, which are in composition similar to flesh and blood, must all have originated in the soil and air. The relative proportion of its constituents are regulated in a great measure by the breed of the animal machine itself, but it is unquestionable that in proportion to the richness of the soil and the character of its vegetation will be the quality and life-sustaining power of the young animal's first nourishment, and upon this nourishment its growth and development primarily depend.

(*o*.) And now with reference to Stock and the principles of Breeding. The stock-farmer should learn soon, and once for all, to rely upon *himself* and the *country itself*, and to be independent entirely of stock imported. He should select the *best bred* males, and *females* too, of the same blood, from the *acclimatized* stock of the country, such as are *best adapted to his particular locality*, and well calculated to furnish the several products he requires. In this selection, he should, as a cardinal point, regard specially the quantity and quality of "yolk," for on yolk, as an essential in connection with Breed and fineness of skin, largely depends the silkiness, as well as other qualities of the skin appendages. Yolk is not only a true soap into which potash and

lime largely enter, a lubricant and a waterproofing, but it nourishes and enriches the wool as well as hair and feathers, and gives them density and quality. If the animals so selected are carefully interbred, according to points of excellence required—having an eye to their mutual merits and their defects, union of the one eliminating the other—they will originate a pure stock, which can be perpetuated and be equal to any imported or to be met with elsewhere. All that are mated, *males* and *females*, should be of the *same pure blood* and judiciously selected, remembering always that *defects* the smallest, *infirmities* the lightest, are, by breeding, *multiplied* and *confirmed*; that variations and imperfections, whether accidental or acquired in preceding generations, are, as well as excellences, increased and established. As similarity is essential to the production of a good strain, subject the offspring to periodic scrutiny, and on those in which there seem shadowed forth such characteristics as you value most, and wish transmitted, set a "first mark." Those of the "first mark" which, after a period, show on second scrutiny least defects, should receive a "second mark." Those which pass muster after a third and final scrutiny, in which the slightest blemish noticed in respect of the qualities needed should be sufficient to reject any of them—those, and those only, should be set aside for BREEDING PURPOSES. All *crosses* should be *pure-bred of the same original stock, but from a different or remote feeding-ground*, from a stock, indeed or family, similarly treated to your own.

"Nature," says Darwin, "gives successive variations, man adds them up in certain directions useful to himself." By this method of stock-breeding (and it holds good of any stock), with suitable food and requisite attention in respect of cleanliness and warmth, flocks and herds may be brought and kept to the highest standard of excellence, whether in the matter of carcase or products of the skin; and in this way the stand-by of the country, sheep, angoras and ostriches, for *uniform* wool, hair and feather-growing purposes may be raised to perfection by the exercise of intelligence, vigilance and industry. This system of breeding applies as forcibly to the horse as to other domestic animals, and would be found equally profitable; and it is, no doubt, the business of an enlightened Government to stimulate by suitable rewards, and encourage by every possible means, the raising of well-bred males in every class of domestic animals.

(*p*.) Cape horses have already had a reputation which

through mischance, or more probably mismanagement, is lost. There is not the slightest doubt that at no distant date there will be in England a great demand for war horses. In the event of a European war 20,000 horses would have to be purchased. They are not to be had in England, and could not be procured on the Continent. To her colonies England would have to look, and to none ought she look with better results than to the Cape. Canadian horses are said to be excellent for military purposes, and the supply is reported to be good, economical in price and capable of immense development. This might surely be said of the Cape, which is capable of breeding horses of any type and to any extent, and she should seek to recover her fame.

As horses for the army, to be secured sound and fit for service, need be bought between the ages of (say) three and five years unbroken, there is yet time, perhaps, to set this industry on foot again. This might certainly be effected at once to the advantage of the Colony and the benefit of the Mother Country, whose Imperial assistance might, if thought necessary, be called in to exercise some supervision over the breeding of the horses, and in every way to aid and encourage the undertaking.

(*q*.) It is no part of this essay to do other than touch lightly on a few salient points or principles of husbandry, much less to enter deeply into the various classes of stock or their general management—the occasion forbids; but it may not be ill-placed to add here a few first principles in their bearing upon sheep-farming.

The SHEEP is an animal on the improvement of which in every respect the prosperity of the Cape Colony must very largely depend. Every attention, therefore, should be given by the agriculturist to grow that class of sheep only *constitutionally adapted to the climate, soil and pasturage of his farm, and this with a view to the best returns.* The determination of this by a practical man, after some experience, should be a matter of little difficulty, and no energy and enterprise thereafter should be spared to bring his flock to the highest possible state of perfection, whether of flesh or fleece. Excellence of wool seldom accompanies excellence of carcase, but both are exportable articles, and it will soon be apparent from the nature of his farm to which of these his chief attention should be directed. Soil we have shown is due to the action of climate, vegetation to the nature of the soil, and good stock to breed and to quality of vegetation, which should be conformable to each other.

The SIZE of the sheep selected for a particular locality

should be in close relation to the nature of the country—a light sheep for the mountains and a heavier for the plains—and the hardiness of its constitution should be more than equal to the probable exigencies of climate and soil. Its FORM should combine structural signs of health and productiveness, though the latter is generally dependent upon the breed selected and on food and treatment. There should always be breadth, depth and fullness of chest, bones small and clean, with tendons and muscles large—all which indicate also a disposition to fatten. The neck should be of that relative length which enables the sheep to browse without discomfort; the head fine and small, facilitating birth and, as a rule, indicating breed; back and loins broad, with no hollows; skin thin, with fleece fine and glossy.

THE NERVOUS SYSTEM OF THE SHEEP is of a much lower order than that of the ox, and still lower than that of the horse, and so its vitality is weaker, while the symptoms of disease are more difficult to detect. The sheep, therefore, requires greater attention, special care, and at all times a rational system of treatment, to keep it *improving*, as it should improve, *steadily from its birth.* On the other hand, it may be laid down as a rule, that if stock of any kind is once suffered to deteriorate, the difficulty of restoring them is exceedingly great and, sometimes, insurmountable.

The FOOD OF SHEEP should be abundant and substantial, chiefly of a dry and not very succulent kind, and for their health sake as varied as possible, though the passing from one *distinct* kind of food to another, or from rich food to poor or *vice versâ*, should always be gradual, lest digestion be disturbed or sickness ensue, to the ruin of the flock.

The value of every sheep-run depends on the fertility of the soil, the quality of the herbage and the system of cropping practised [Essay II (*e*)], and the grand principle of sheep-grazing is to make the most of whatever is grown, that is to convert pasture and crops, with the least waste, into useful products. Sheep thrive best on a pasturage short and sweet, and not over luxuriant (which is best for cattle), the lambs especially, preferring young grass. Where the pasture varies and good herbage is "patchy" the flock should be divided into lots of different kinds, young and old, and grazed according to the quality of the pasture; or so that each lot in its ramble may receive a fair share of mixed food. Where the veldt is tolerably uniform, sheep may be run altogether and moved every few days from one spot to another, so as to enjoy a continuous change

of food, one portion being grazed over while another is freshening up. Good herding is the salvation of stock.

If food of any kind is grown—and it *should be* abundantly grown, even if there is no market for it, for there is stock enough of all kinds, pigs included, to eat it—it is but economy that the serviceable sheep should receive its share, and under such circumstances, too, that its manure shall most profit the soil. Turnips and other roots (which are best fed off the ground) though of a watery nature, are undoubtedly excellent food from their percentage of phosphates, if *drier* provender is added thereto to prevent looseness and falling off, even if such dry food be but wholesome chaff; while common salt or some tonic condiment should be constantly at their service, to give a pleasant savour to their food, and relieve the sameness of their ordinary diet.

Be it ever understood that the more substantial food the sheep obtains, the more produce the farmer makes, the more manure he gets, the more corn and other crops he can grow, and the better is his pasture. Sheep in movable folds of moderate size—that they be not overcrowded and that their manure be evenly distributed,—if artificially fed (say) on fallow ground (loosened, when stiff and hard, before they are enclosed, or *shallow-ploughed* directly they are removed) —will, by the finely-divided manure they make, induce a general and progressive improvement of the soil and by consequence of vegetation. And so also this, and much more readily and remunerative, if sheep are folded on *arable* ground and limited to the range of each enclosure.

Every farmer should know the capabilities of his farm and act accordingly; but a good general system of "Rotation" is a course of seven years' cropping turnips, fed off the soil; flax; barley, with selected seeds (Sutton & Sons, Reading); for three years lay wheat. Wheat thus returns every seventh year; a crop of flax is grown which is in every way paying, while the soil is for a period of years under permanent pasture, during which it receives ample dressing from the increase of stock and a reserve of fertility from atmospheric and other causes.

When a large portion of his land is under the plough, the flockmaster can shift his flocks from one class of food to another, feeding them thereon alternately. The green crops grown, whether turnips, mangolds, artificial grasses, clover, vetches, sanfoin, rye, rape or what not, with any nutritive material thrown in as an auxiliary, such as oilcake, meal, pease, corn (mealies, oats, &c.), to make the green crops hold out, are all speedily changed by the sheep into marketable

products, and the farm becomes at once, by a natural circulation of material, a flesh and wool manufactory on a large scale, which is the HIGHEST DEVELOPMENT OF AGRICULTURE. The soil by this system is cleaned and pulverized by the plant growth and tillage—consolidated, if loose, by the constant treading of the sheep—and so abundantly enriched by the manure made, which is always the more valuable in proportion to the quality of the food supplied, that the farmer or flockmaster is in his turn enriched by a succession of crops far beyond all his expectations.

To farm upon such principles as those mentioned, it is necessary that the flockmaster should cultivate just that class of sheep which will succeed best on the food he has to give them, and yield him in return a fair average quality and quantity of fleece and carcase, if not absolutely the best. And here, by way of parenthesis, one word on ENSILAGE. This is a method of turning, by a species of fermentation or "partial digestion," green crops of any kind into highly nutritious food for cows, horses, &c., to act as a grateful supply in time of drought or scarcity. This is effected by closely packing, treading or ramming down (*to expel the air and prevent putrefaction*) artificial grasses of all kinds, clover, spurry, green oats, barley, buck-wheat, maize, &c. (chaff-cut) into a "SILO," mixing with every ton of vegetation about 20 lbs. of salt, and finally boarding over and keeping the mass air-tight with a five-inch layer of earth, sawdust, or, better still, bran, and weighting it heavily on the top with boxes filled with stones. Silos or store-rooms require no large outlay; any simple structure, from an outhouse to a clean wine cask, provided *thoroughly air and water-tight and cool*, is all that is required to render valuable the surplus green stuff of the farm.

Having decided on the class of sheep which is suitable, skilfully select such rams and ewes the union of whose qualities and points of excellence will get rid of or diminish their defects, and so secure in the offspring what is desired. So plastic and so pliant to culture is the sheep that this is speedily brought about. Not without great care, be it remembered, and attention, and much time, too, can any animal be made to accommodate itself to change of *climate and food, for both these must be in exact accord with its natural requirements*, and no transference can be made from bad keep to worse without serious detriment. Any attempt, therefore, TO BREED FROM STRANGE OR IMPORTED STOCK is a fallacious enterprise, unless carried out with due consideration for these facts.

IN BREEDING the male exercises the higher influence on the progeny, on which it stamps external shape, form and character, and this influence extends under any circumstances to the generation that succeeds. No crossing, therefore, of special blood is of any value unless *continued for several generations.* Furthermore, a young ram in a favourable season is considered to throw a large number of ewe-lambs, and *vice versâ* an old ram, of males. The EWES should, without doubt, be well fed up for the ram, but not kept high while carrying, and this on physiological grounds. The RAM should be vigorous, a shearling is best, though no good, efficient ram should ever be discarded. If the sheep are allowed to roam, one well-selected ram, during six or seven weeks, to every forty-five or fifty ewes is enough, but as the first cross takes most to the sire and the second to the dam, never the same ram to the same ewes for more than one season.

During GESTATION (twenty-one or twenty-two weeks) the ewes should be drafted out of the flock and suffered to take reasonable exercise only, for the sake of the health both of themselves and future offspring. During LAMBING they should be herded in a temporary fold of bush or hurdles shifted constantly, daily if possible, to fresh and dry ground, in order that they may be *clean and warm*, and that both ewes and lambs, being more readily seen, may be more promptly aided as they require attention. When the LAMBS are strong they should be fed for at least a month on nutritious grass (rye, sanfoin and clover), and after this, separate from the ewes, on finely chopped roots (white carrots best) and crushed grey peas, bruised oats, bran and ground oilcake (always at dawn, and now and then during the day), from suitable troughs, which should always be filled at night. Upon these principles the lambs, which should be ever in the open and continue to gain a quarter of a pound per day from birth, will gather stamina and be prepared, at about eleven weeks old, for their start in life, which should be on the tenderest herbage to be had; while the ewes are removed out of hearing to a dry and short pasture.

As to WOOL, a fleece is made up of a collection of locks, and each lock of a bundle of hair fibres known as the STAPLE. Each fibre of the staple is again made up of a series of *microscopic* conical tubes or inverted cones, like the links of a scaly, snake-pattern watch-chain, all fitting into one another, the base of one cone receiving the apex of the other in regular succession, being "imbricated," that is, over-

lapping at the edges, in such a way as to cause the fibres to cling to each other. That staple is the best in which the tubes are uniform throughout and all of equal diameter, but a variation in the diameter of the tubes or cones gives the character of extra fine, fine, middling and coarse. The best qualities of wool, its silkiness and pliability, depend upon the YOLK, which is a soap-like fluid secreted by minute glands of the skin, that rises and permeates the fibres. The composition and properties of this substance affect the nature of the wool and are an index of its quality, varying in different breeds, the thicker and more strongly coloured communicating to the wool a coarser feel. Harshness in wool, however, is often due to peculiarity of pasture, itself depending on the nature of the soil, which when rich and loamy invariably induces a softness of texture and a desirable silkiness in the fleece.

As wool, like hair, is a natural product of the skin which furnishes the mechanism of its growth, and is the source of its nutrition, it necessarily participates in the skin's degeneracy, indeed, in any departure from its normal health, or a falling off in the condition of the sheep. The cones of each fibre are then imperfectly or irregularly formed, losing their "imbrications," the structure being altered through some faultiness in the mechanism or defective nutrition. The staple, therefore, is robbed of its elasticity, mellowness and softness; its flexibility becomes brittleness, through the want of uniformity in the component tubes; it loses its curved and twisted form and lustre, and is rendered "mushy" and utterly unfit for "felting" and other processes of manufacture. This is the inevitable effect on the wool of deficient food and care, or that disease of the skin specially known as SCAB.

Long wools, it may be added, furnish *combing* wool; the finer being used for the choicest *worsted* goods, the coarser for blankets, rugs and coarser worsted. The best *woollen* cloths and fabrics are manufactured from the short or carding wool, the finest class of which is produced by the PUREST BRED MERINO, and this fine woolled sheep may certainly be bred in South Africa and abundantly multiplied wherever industry and intelligence are brought to bear. If the already acclimatized stock of this variety be properly managed and improved, there can be little doubt that no more *useful* wool could be grown anywhere than that which the Cape Colony could furnish.

"Among the various points that characterize the QUALITY of wool are the fineness and elasticity of the fibre; the

degrees of imbrication of fibre as seen under the microscope; the quantity of fibre developed in a given space of the fleece; the comparative freedom from extraneous matters; and the skill and care employed in the preparatory processes."

In the MANAGEMENT AND PREPARATION OF WOOL, it must be premised that the sheep should be well washed before shearing, say a week or ten days, so as to allow the yolk to again rise in the staple. The times of shearing must be governed by the food supply, the breed of the animal and the judgment of the farmer. After shearing, all impurities should be most carefully got rid of. Wool from different breeds and different soils should be separated and kept together, each package or bale containing wool only of the same general character as to colour, fineness and length of staple. Each fleece, divested of the breech and stained locks, should be spread one upon the other, the neck of one on the tail of the other, and so on alternately, the sides finally folded towards the middle, the whole then rolled together, beginning at each end and meeting in the centre, and all without stretching or breaking a fleece. In this matter of assorting, arranging and preparing the wool for market, TOO MUCH CARE CANNOT BE EXERCISED.

Before closing these observations on the sheep let one word be added as to the CONTAGIOUS DISEASES of stock, whether of sheep, cattle, ostriches or poultry. In their treatment and as a means of prevention, the writer is convinced of the value of "ALTERNATE INOCULATION" so called, and would suggest that the system be tried wherever practicable. The principle is the same as that of "vaccination" in the human being. The small-pox *virus* passing through the veins of the cow becomes so attenuated that the inoculation from the disease in the cow does not produce *small-pox* but a milder disease *cow-pox*, which acts thereafter as a safeguard against small-pox, and prevents its multiplication by reason of its using up the living material without which the more virulent disease could not find footing in the system. Similarly it is contended that the virus of any infectious disease may, by a like process of alternate inoculation, be robbed of its malignancy and be utilized as a safeguard accordingly, and to prove that this is worthy of attention one has but to quote Griffith's experiments in Choleraic Inoculation of Chicken (*Poultry, vol.* 1, No. 7) and Prof. Woodroffe Hill, F.R.C.V.S., on "Canine Inoculation for Prevention of Distemper," omitting the mighty works of Pasteur.

(*r.*) But this is a lengthy digression. Under any circumstances, be it said, whatever be the kind of stock grown, no profit can possibly accrue to the farmer by feeding stock that is *ill-bred*. The orthodox principle and the most profitable is to keep only the best breeds and to see that they are well and regularly fed with wholesome and sustaining food, and that their manure is fully utilized. And touching this matter of food and attention, it may be safely affirmed that perfection of breed will be largely influenced by the nature and sustaining power of the food supplied, and will be further encouraged by the fell determination on the part of every farmer to stamp out, by vigilant supervision, the advancing armies of devastating parasites—vampires of every description that are a scandal to the farmer and that drain the life-blood from every species of his stock. Of these the Scab-mite, taken alone, is itself a curse, a reproach and an incalculable loss to the wool industry especially, and to the country generally. No effort, however laborious and costly, to clear out the plague and repair the waste of long years, should be considered too great. One *united* effort would accomplish it, and the colony be relieved of a mighty bugbear.

(*s.*) It is certain that the cause of SCAB is the same in sheep, goats, horses, cattle and dogs, viz., a skin-infesting egg-laying mite, that rapidly multiplies and widely extends itself, though the species inhabiting one animal differs from the tenant of another. Healthy and plump, well-fed stock are not the feeding ground of these pests,—they dislike a fatty tissue. They confine their ravages to the poorer and lower-conditioned, where the skin is more readily burrowed or bitten, and in these the growth of wool and hair is undermined.

To oust the scab would be to increase, and that speedily, the quantity and quality of the wool exported, and with it the annual revenue. One of the most potent antidotes is arsenic—2 lbs. to 80 gallons of water for 100 sheep—and we believe perfectly safe; but as mineral poisons are often improperly used, perhaps the safest cure for scab is Stavesacre in decoction, 1 lb. to 4 gallons, or tobacco infusion the same, or sulphide of calcium—proportions, 2 lbs. of sulphur, 1 lb. of quicklime, 16 gallons water boiled together and continually stirred, till well mixed. Either of these may be used as "dip" or "wash."

But it is idle to talk of *cure* unless suitable measures are taken to *prevent*. As long as any man who owns sheep, perversely ignorant or scornful of facts, or too indolent to

regard them, chooses indirectly to encourage the disease by his sluggish or ill-directed efforts, or no efforts at all, the diligence of his more enlightened and energetic neighbour, who studies and labours to improve his flock, will ever be useless and abortive, and the flocks of the country be everywhere jeopardized. Fencing, as a means of protection, is an important point gained, but fencing alone is utterly powerless to eliminate the scab. What is imperatively demanded is a stringent Scab Act, which will at once reduce all risks to a minimum, and compel every farmer to keep his flocks *clean* under a heavy penalty, and no half measures.

Legalized periodic inspection of flocks by Government-appointed inspectors, unbiassed, unfettered men, receiving reasonable salaries under the central guidance of an Inspector-General, are absolutely necessary factors for the carrying out of measures imperative in the cause of individual justice and public weal; and this at really almost any cost. It should be speedy, lest it should be too late. The disease is not only curable, but easily stamped out, and it is but right that such measures as can alone eradicate the evil should be strictly enforced; and especially so, as they would receive the support of all intelligent farmers. Such measures would tend directly to stop the incalculable loss annually experienced, a loss to be redeemed only by at once giving the wool of the country a fair chance of development, both in quantity and quality.

(*t.*) In the preceding pages, imperfect as they are, an endeavour has been made to explain some of the principles, scientific and otherwise, on which the successful cultivation of the earth and the profitable rearing of cattle *must* depend, either in this or any other country. They all hinge on the one great principle of Nature: THE INCESSANT CIRCULATION OF MATTER through various forms of existence; that which was once air and soil and ocean, is now animal; that which is now animal, is momentarily returning to air, and soil, and sea. The results of agriculture will depend upon the methods by which this great law of Nature is turned to account, the activity of the changes brought about, and the assistance rendered to Nature's processes by the intelligence and, especially, the industry of man.

It has been said of some of the inhabitants of this country that, "they found it a paradise and have made it a wilderness." This is possibly not far from the truth in the destruction of forests and the degradation of the veldt. Starting with no knowledge of Nature's laws, they made a law for themselves, and long years of mismanagement can

only be redeemed by a steady system of economic and rational agriculture. The main features of such a system, and the principles on which it is based, the foregoing observations are a humble effort to explain. The Earth will always yield her increase, if the industry of man will but increase her means of yielding it.

TABLE I.

SHOWING THE AVERAGE COMPOSITION OF VARIOUS KINDS OF FOOD-PLANTS, &c. (PROF. JOHNSTON AND OTHERS.)

	Water.	Fibre.	Starch, Gum, Sugar.	Gluten.	Fat.	Ash.	Ratio of Gluten to Carbo-hydrates.
							as 1 to
Wheat	15	15	55	10	3	2	5½
Barley	15	15	55	10	2	3	7½
Oats	16	20	40	10	4	4	6
Mealies	14	6	65	10	5	2	8
Buckwheat	14	23	52	9	...	2	6¾
Beans and Peas	14	10	45	24	2	3	2½
Potatoes and Apples ...	75	3	16	2	0⅓	1	10
Turnips	89	2	6	1½	0⅓	0⅔	5
Carrots	87	3½	7	1¼	...	0¾	8
Cabbage	89	1	7	2½	...	0½	5
Linseed	9	8	20	25	34	4	...
Do. Rape & Poppy Cake	12	12	30	28	12	6	2
Mangel	88	1	8½	1½	0¼	1	8½
Beet	82	1¼	15	1	...	0¾	15
Parsnips	82	8	7	1¼	0½	1	6½
Pumpkin	90	2¾	5¾	0½	...	1	15
Lupines	14	13	36	29½	4½	3	1¾
Green Rape	87	3½	4	3	0¾	1½	3½
Do. Rye	75	10	9	3	0¾	1¼	6
Do. Mealies	...	...	...	...	...	...	
Do. Lucerne	...	...	...	...	...	...	2¼
Do. Fieldbeans ...	...	...	...	...	...	...	2¾
Do. do. ...	...	...	...	...	...	...	3¾
Do. Buckwheat ...	...	...	...	...	...	...	5
Do. Lupines	...	...	...	...	...	...	3
Do. Oats	...	...	...	...	...	...	7
Dried Figs	21	...	73	6	...	...	...
Do. Dates	23	...	63	3	...	2	...
Sunflower	11	54	...	12½	20	2½	...
Do. Cake	10	11	22	34	12	11	1½
Cow Milk...	87·5	...	5	3·2	3·6	7	4·4
Condensed Milk... ...	21·5	...	52·9	10·2	12·9	2·5	8·3
Butter Milk	90·1	...	5·4	3	1	5	2·6

TABLE II.

SHOWING COMPOSITION OF THE ASHES OF

	Wheat.	Oats.	Barley.	Rye.	Mealies.	Beans.	Turnips.	Potatoes.
	in grain							
Potash and Soda ...	31	26	32	33	32½	45	51½	63
Lime	3	6	2½	5	1½	8⅔	11¼	2
Magnesia	12	10	8½	10½	16	6½	3½	5
Oxide of Iron ...	1	0½	0½	1½	0¼	0¼	0½	0½
Phosphoric Acid ...	46	44	26	48½	45	33	11¼	18
Sulphuric Acid ...	...	10½	2½	1	3	4½	15	4
Chlorine	6	0¼	5	...	0¼	1¼	5½	6
Silica	1	2¾	23	0½	1½	0¾	2	1½
	100	100	100	100	100	100	100	100

COMPARATIVE FEEDING VALUE OF

Rye	1·00
Wheat	1·07
Barley	0·86
Oats	0·84
Beans	1·45
Linseed Cake	1·52
Rape Cake	1·42
Cotton Cake	1·68

TABLE III.

CARBO-HYDRATES. (PROF. JOHNSTON.)

Carbon.	Water.	
36 lbs.	and 45 lbs.	form 81 lbs. of woody fibre or dry starch or gum
36 lbs.	and 49½ lbs.	do. 85 lbs. of loaf, cane or milk sugar
36 lbs.	and 64 lbs.	do. 100 lbs. of fruit or honey sugar
36 lbs.	and 27 lbs.	do. 63 lbs. of humic acid

GUANO.

One ton of Peruvian Guano =
- 33½ tons of farmyard dung
- 21 „ horse dung
- 38½ „ cow dung
- 22½ „ pig dung
- 14½ „ mixed human excrements

VII.

FORESTRY IN INDIA, THE COLONIES AND THE CAPE COLONY.

By D. E. Hutchins, *Conservator of Forests, Cape Government Forestry Department, King William's Town*

In giving a lecture on Forestry it is difficult to select what part of the subject to speak about. In Europe three years are required to pass through the School of Forestry at Nancy, in France. Forest literature is almost exclusively in the German or French language, and is thus not always readily accessible to Englishmen. It is a curious spectacle, that of Englishmen coming from the little island with no forests worthy of the name, with no forest literature in their own language, called upon to manage the vast forests which are one of the grandest heritages of Englishmen beyond the seas. "No race," says Professor Thisleton Dyer, "now owns such large forests as the English." As you are probably aware, the establishment of a National School of Forestry is now under contemplation in England; and Englishmen, even at home, have begun to realize that not the least of the responsibilities that have grown up with the expansion of their race is the care of forests. I shall confine myself to-day to glancing briefly at Forestry in India, in the Colonies, and here in the Cape Colony.

The Indian Forest Department, guided at the outset by a handful of German foresters, has the honour of being the pioneer of English Forestry. But its example is being followed by Canada, Australia, New Zealand, Ceylon, Mauritius, the West Indies, the Straits, and by Hongkong, where Forest Departments are now either at work or are being established.

The last decided step in Forestry is now being taken by New Zealand, where, under the guidance of its enlightened statesman Sir Julius Vogel, now again Premier, Forest Conservancy and a Forest Department are being inaugurated. This is understood to be mainly on the lines recommended by Captain Campbell Walker, an Indian forest officer sent to report on the New Zealand forests in 1877.

The Hollanders have a Government Forest Department,

for their teak forests of Java; and perhaps, as I shall not have occasion to recur to the Dutch in Java, I may mention here that the area of these teak forests amounts to 2,280 square miles, and that during the fifteen years, from 1865 to 1880, as many as 24,700 acres have been planted up. "These forests," says Dr. Brandis, "are situated on the eastern or drier portion of the island, and, like the Indian teak forests, were formerly overrun by the annual fires of the dry season." The fire protection, and the planting, of such a large area in these forests, are evidences of a material progress in Forestry, and are on a par with other matters which the Dutch manage very successfully, in Java.

I have before me a pamphlet, entitled "The Progress of Forestry in India," by Dr. Brandis, the "Father of Indian Forestry" as he has been justly termed. Were there time, I should like to read copiously from this, but I must content myself now with placing the following extracts before you, illustrating the progress that Forestry has made within the last fifteen years in that country.

The first real attempt to introduce systematic forest management into India, is barely thirty years old. It is only twenty-one years since Dr. Brandis, the first Inspector-General of Forests, was appointed, and systematic forestry placed on a firm footing throughout India.

Now, most of the Indian forests are worked on principles approximating more or less closely to the systematic management of the forests of France and Germany. And, in addition, there has been developed that extensive system of fire protection which is peculiar to India.

The forests most commonly met with in India are vast tracts, where the timber trees occur scattered amongst grass and bamboos. In the dry season, the grass, which is often as high as a man on horseback, burns; and forest fires of terrible intensity, extending over wide areas, are the result.

Speaking of forest fires, Dr. Brandis says:—"Only the dense evergreen forests of the Himalayas and of the moistest regions of India are safe from these fires; but in the deciduous forests, which prevail on the plains and on the lower hills, the fires of the dry season are an annually recurring event. They are lighted in various ways, but are certain to occur with the conditions that prevail. The injury done to the forest is incalculable. The idea of stopping these fires was at first regarded as Utopian, but they have been successfully coped with over large areas, with the best results to the forests."

Forest fires in India are controlled and kept within

bounds by a system of fire-paths, which cuts the forests up into a number of small sections. These sections are isolated one from the other by cleared lines of burnt or cut grass. The effect of fire protection in India has been to make the, forest denser, and thus to stifle the grass, and render less year by year, the danger of the forest burning again.

When afforesting can be so actively advanced by fire protection, planting falls into the second place, but planting has not been neglected in India. The whole area planted in the provinces under the Government of India, aggregated 33,000 acres in 1882. In addition to this there are plantations in the Bombay Presidency; and, notably, in the Madras Presidency: teak on the western coast, casuarina or beefwood on the eastern coast; and, what has most interest for us, the fine plantation of gums and blackwoods in the temperate climate of the Nilgiri mountains.

Turning again to Dr. Brandis' pamphlet, we read:—" In addition to the regular plantations, there has been much sowing and planting in the forests, in order to aid natural reproduction; the areas thus operated upon, however, are not included in the figures here recorded. Broadcast sowing of seed, without any previous preparation of the ground, has not hitherto yielded good results. Attempts have also been made to favour the growth of the more valuable species by cutting back saplings of the less valuable kinds.

" The cutting of creepers is an operation peculiar to India. Many forests, when first taken in hand, are found to be full of these large climbing shrubs, the stems of which, as thick as a man's thigh, but as flexible as a rope, were seen winding round the trees or hanging upon them, while the dense foliage of the climber completely smothered the crown of the tree. Teak and sâl are frequently attacked in this manner, and the result is stunted growth and irregular shaped stems. The eradication of these creepers has generally been one of the first operations when the protection of a forest was taken in hand; and in many of the more valuable forests they have been eradicated.

" When a systematic treatment of the Indian forests was first attempted it was found that in most cases those forests which were accessible were exhausted, and that only those which were remote and difficult of access contained timber and other material fit for sale. The necessity of making these forests available by improving the export lines and other means of communication, forced itself early upon the attention of those who were charged with their administration. In Burma, where the teak timber is floated down

from the forests, large areas had fortunately been protected by natural obstructions in the streams, which prevented the export of the timber growing above them. In 1858 operations were commenced to open out these obstructions by blasting the rocks in the rivers, and ever since that time this work has been steadily continued."

This is a somewhat long extract, but it offers a curious parallel to the work we have before us in the forests of Cape Colony. We have no rivers fit to float timber, but as regards forest roads the analogy is perfectly true.

In the Amatola country there are large areas of virgin forest and larger areas of unharmed forest, protected by the absence of short, easy roads, which any combination amongst the wood-cutters might have made at once; but with them it was every one for himself and the bush-ranger take the hindmost!

For many years, in India, they were occupied in doing what we are now doing in the Colony, *i.e.*, demarcating the forest, or examining all vacant Government land, and laying out the boundaries of the land that is to be finally and definitely preserved as forest.

The area of demarcated forest in India stands now at about 30,000 square miles.

When all the forests in this Colony are demarcated they will hardly amount to the one-hundredth part of this figure, even supposing it to be decided eventually to add to the Eastern forests the 60 or 80 square miles of vacant land on the upper slopes of the Amatolas.*

Though the chief result of the operations of the Forest Department in India has been the improvement in the capital value of the forests, the revenue has advanced with their systematic management. The revenue from them, which for some years stood at £360,000, has risen steadily, and now amounts to over a million sterling. Thus in thirty years the Indian Forest Department has added a million to the revenue of the country, and it has now under its charge 30,000 square miles of well-defined and efficiently-managed forest.

From my experience of the forests in India and of those in the Cape Colony, I consider that the latter are at least as valuable, area for area, as the former; and as the Indian

* Since the above was written it has been decided to add the Amatola grass lands to the Forest Reserves, and the Hon'ble the Commissioner of Crown Lands and Public Works has a project for beginning planting on a large scale by means of convict labour. It is scarcely possible to exaggerate the usefulness to the country, in more ways than one, of such a scheme.

forests now yield £1,000,000 per annum, I entertain the confident hope that before long the forest revenue in this Colony will yield the one-hundredth part of this, namely, £10,000 per annum.

Among Indian forests the teak forests are probably the most valuable. Yet the average teak forest in India is, area for area, economically inferior to the mountain forests of the Cape Colony. The Indian teak forests are, in fact, vast areas containing scattered teak and other trees, and deriving almost all their whole value from the presence of these scattered teak trees. But teak, at the present moment, has such an excessive value in the world's market that a comparatively small number of teak trees make a really poor forest valuable. Teak-wood is selling now at about seven shillings per cubic foot on the London market. In tropical countries there is no wood approaching teak for constructive purposes, and it is nearly as good in the leg of a table as in the girder of a bridge.

In extra—tropical countries like this, free from that pest of all wood pests, the white ant, teak has by no means the value that it has within the tropics; and it is frequently used when native woods, far more ornamental, and equally suitable in other respects, could be had at one-tenth the cost!

The Indian teak forests are unhealthy at all seasons of the year, and deadly at times. Sawing in the forest, which affords a healthy occupation to a large body of men in this country, is little practised there. If I were a speculator, and were offered a square mile of average teak forest in India or of average timber forest in the Cape Colony, I should certainly choose the latter.

The forests of Cape Colony have an advantage over those of India in facilities for exporting hard woods and ornamental woods to Europe. To give an instance: it costs about £4 from the time Cape box is cut till it reaches the London market. The same figure for boxwood sent from India to England is £19.

FORESTRY IN AMERICA.

In the United States, forest destruction has been much discussed. So early as 1799 an Act was passed by the United States Government, reserving, for the use of the navy, the cedar and oak forests—*Juniperus Virginiana* and *Quercus virens*—of Louisiana and Florida. Forestry there has sustained a recent blow in the removal by death,

a few months ago, of Dr. Hough, an earnest friend of trees, and an able writer in the cause of Forestry. Dr. Hough was engaged in drafting a Forest Act at the time of his death. In that country there are still localities where forests cumber the ground, where they must be in great part cleared, in order to people the country. There are other localities where every tree is a blessing, a gift as it were, direct from the hand of God—interior scorching plains, and mountains, which must either be clothed with forest or cursed with sterility.

In looking at maps, the reflection arises: If one could regulate the distribution of land and water, what a superior place our world would be? Something similar occurs in the distribution of forest and open country; but here man has the fashioning of the earth in his own hands. Unfortunately it is so much easier to deforest than to afforest, to mar rather than to make. There is a useful and very interesting American work on this theme, entitled "Man and Nature," by Marsh. In the interior States, with dry climates similar to that of Cape Colony, tree-planting has taken a practical and pleasant form in the institution of Arbor days. In 1883, the State Legislature of Ohio issued a Government Proclamation, setting apart the fourth Friday in April of every year as a public holiday, to be called Arbor day. Why should there not be Arbor days here—and folk go apicnicking and tree-planting, on the commonage around the towns? After such a summer as we are now having, with plenty of moisture in the ground, tree-planting next autumn would not be difficult, and Arbor days might make a start, with the prospect of becoming institutions amongst us. Details suggest themselves at once. Many people have trees to spare in their gardens; owners of oak groves, probably thousands. The price of a bottle of champagne would purchase fifty trees. To prepare the ground, parties and sites should be arranged beforehand, and the active members of each party turned out before breakfast, with spades and pickaxes on their shoulders, so as to dig pits for planting trees, or break up patches for sowing seed. This healthful exercise should go on for some days before Arbor day itself arrives. Then comes the great picnic, when the labour of the active men passes under review, and—doubtless—will have its reward. Party should vie with party, each putting into practice its own ideas on "trees and how to plant them"; and thus stimulating that active interest in trees and forests which might be productive of so much good in this country.

In addition to Arbor days, which seem to have taken root as a permanent institution among the Americans, there is a State Forestry Department. Several tracts of forest have been reserved as public parks or domains, notably the Yosimite Valley in California, where there are those gigantic Wellingtonias, the absolutely largest trees in the world, and the ground around the Niagara falls.

American forestry interests us specially, because their wood undersells ours. There are several reasons for this. Their forests have a mass of material within a small compass similar to which we cannot command at present. This renders the working and extraction of timber there more economical. Then, again, they have vast tracts of forests, which are being worked destructively and free of the restrictions necessary to preserve the forest. The number of cubic feet of wood cut in the United States annually is estimated at twenty billions, a figure which is estimated to be about five times the growth of the forest. Then, again, the American wood reaches us well-seasoned ; ours is put on the market green, within a week or two after being felled, and being green, it cracks and warps in the way with which we are all too familiar.

Then, again, the American pines and deals are softer and thirty per cent. easier to work than the colonial yellowwood, with which it comes into competition. I doubt if people are quite aware how this fact affects the use of colonial woods. Harder, more ornamental, and generally superior to deal, contractors and carpenters will slip deal into specifications if they can manage it, because it is easier to work than yellowwood. Closer and more even in the grain, yellowwood is in every way superior to deal for flooring. It will wear longer, and in wearing it does not produce those splinters observable in the wear of a deal floor. Indeed, a well-seasoned yellowwood floor, in its even wear, approaches the perfection of a teak floor. Naturally, if yellowwood is put in green, it will shrink and it will warp ; but, unless my memory is altogether at fault, it behaves itself better than the green deal I have seen put into builders' speculations in England. And, be it remembered, the green deal is in the mild climate of England, while the green yellowwood has to face the siroccos of this country.

CANADA.

The area and condition of the forests in Canada vary in the different provinces. In Nova Scotia a large part of

the forests was destroyed by a fearful forest fire in 1784. In British Columbia the forests, quite recently, were stated to be inexhaustible, but the latest accounts say that serious inroads are being made in them. In Quebec there are large areas of Crown forest. Canada, with its immense forest resources, is awakening slowly to the necessity of conserving them. Even in Canada timber will not always be "lumber" in the ordinary sense of the word. Let me read you a few words by Prof. Bonney, F.R.S. Speaking last year at the Royal Colonial Institute, he said:—'The other thing which struck me, as a traveller, is that there is danger lest Canada should imitate the example of young people, in living rather too fast, and using up their resources too quickly. You cannot go on using even the fat soils of the West, year after year, without producing a state of exhaustion at last. It seems to me that there is great waste going on in the Canadian forests. By the liberality and kindness of the Canadian Pacific Railway Company, I was enabled to take a journey into the interior, East of Lake Huron; and I was painfully impressed by the reckless destruction of forests that is going on. It left upon my mind an impression absolutely sorrowful, to see the enormous waste of timber. You cannot go on using the gifts of Nature in that way without having ultimately to repent of it."

So far we may congratulate ourselves that anything like this wholesale destruction of forest has come to an end—in the Cape Colony proper, at all events: but in the next sentence Prof. Bonney hits us, when he speaks of the necessity of forest laws. He continues:—"I do hope the Canadian Government will make stringent laws for the preservation of the forest. I know that the difficulties in the way are great; and I know the singular obtuseness of Englishmen—the singular objection to be ruled in all matters where they do not exactly see the why and the wherefore. I do, however, hope that these splendid forests, stretching over hundreds and hundreds of square leagues, may be saved from the reckless devastation to which they are too often exposed."

About the same time that these words were uttered in England the Canadian Parliament passed a law, reserving considerable forest tracts in the Rocky mountains, the first object in view in making the law being to preserve the valuable streams that rise in the Rocky mountains. Generally, however, forests in Canada have not the climatic necessity of forests in the Southern colonies. There are

large areas of forest in Canada which, economically speaking, should be cleared to make way for cultivation. It is true that, by doing so, the winters and summers, already sufficiently rigorous, will be made more severe; but there is none of that absolute necessity for forest preservation which exists in countries nearer the sun and still outside tropical rains.

Listen to what is said by Professor Thisleton Dyer, the eminent botanist at Kew, in his evidence given a few months ago, before the Select Committee of the House of Commons on Forestry.

CYPRUS.

"A great deal can be done in preserving the remnants of forests, but to replant a mountain range, which has lost its arboreal covering, is an exceedingly costly thing to do, and a difficult thing to do: all that can be done is to preserve the remnants from going from bad to worse. It was calculated that by the end of the century there would not be a stick left upon the Island. Our operations, however, have stopped that sort of thing; considerable portions of forest have been closed; the tapping for turpentine has been stopped; goats have been kept out, and important blocks of the forest have been permanently saved, which is a considerable gain. In the Lebanon, which is not very distant, in the Turkish dominions, the late Forester, Dr. Dobbs, has paid a visit, and he says the absolute denudation of the country is going on steadily, and in the Mediterranean climate the absolute removal of the woods simply means that the country becomes incurably sterile. I have even seen it stated, quite recently, that there is every reason to suppose that the Western Sahara was once clothed with forest."

STRAITS.

The new Forest Department there has issued its first annual report, and gives a good record of work done, both in planting and demarcating reserves. It has been observed in the Straits, that since the removal of the forests the rainfall has become irregular, with droughts of some duration. This is in a tropical country with a rainfall of over 100″ per year!

WEST INDIES.

A forest officer, from India, has been sent to the West Indies, and has commenced work there during the last few

weeks. In Jamaica there is a planting department in connection with the public gardens. There is a flourishing cinchona plantation in the mountains, where also the pencil-cedar (*Juniperus Bermudiana*) and two species of *Podocarpus* (our old friend the yellowwood genus) are hardy, useful trees. In the Blue mountains, between 4,500 and 6,500 feet elevation, the mean annual temperature is the same as that of the Cape Colony, viz., 63°, but the rainfall tropical, and over 100".

AUSTRALIA.

In Australia, Baron von Mueller, the author of "Eucalyptographia," "Select plants for extra tropical countries," and other works, has perhaps done more to forward tree-planting, especially of eucalypts, than any man now living.

In the Colony of South Australia an active State Forest Department has been in existence for about eight years. The Forest Department there has an annual revenue of about £5,000, derived almost exclusively at the present time from grazing. It devotes its energies chiefly to tree-planting, and the following work is being done during the current year:—

To be planted out, 50,000 pines, 2,000 oaks, 1,000 American maples, 1,000 catalpas, and 1,000 of other exotics: also, 490,000 Australian gums. An equal number of gum seedlings are to be given away. Where they are planting the rainfall is favourable, in quantity and incidence, being similar to Cape Town.

Queensland is less advanced in forestry than the older colonies, but there is a useful department for the distribution of plants and tree seeds.

THE CAPE COLONY.

In this Colony the Forest Department has been in existence, as a separate organization, for five years.

In 1880 the services of Count de Vasselot de Regné were obtained from the French Forest Service, and a Forestry Department, under professional guidance, inaugurated in the Colony.

I propose now giving you a short sketch of the forests in the East of the Colony, of which I have had charge for the last two years.

EASTERN FORESTS OF CAPE COLONY.

These forests fall naturally into two classes; (1) the scrub

and brushwood forest of the coast region; (2) the high timber forest of the mountains.

The first is by far the most extensive, but with the exception of the Alexandria forests, it is almost destitute of timber trees.

The coast scrubs gradually improve as we go eastwards, and approach the better watered Transkeian coast. Nothing could be more desolate or less like the typical forest than the dreary Addo bush. The Kowie bush contains a few small trees; the East London forest larger trees, amongst them the Cape boxwood. The forest in the Alexandria division would be classified, naturally, with the Knysna forests, were it not that in its trees it is an eastern forest. No forest in the Colony has contained better sneezewood (*Pteroxylon utile*) than the Alexandria forests; and there is an entire absence of stinkwood (*Oreodaphne bullata*), the valuable tree of the south-western forests. Port Elizabeth is, in fact, on the boundary line, between the Eastern and Western forests; the Eastern, where the valuable tree is sneezewood, the Western where it is stinkwood (now more euphoniously termed "laurel wood"). With their large yellowwood (*Podocarpus*) and sneezewood trees, stout in girth, short in bole, the Alexandria forests occupy an intermediate position, between the scrubs of the coast and the high timber forests of the mountains. Formerly remarkable for the abundance of sneezewood of large girth, the Alexandria forests still show a good re-growth of this valuable tree; and I hope that before long the operations of the Forest Department will be so extended, as to permit of the systematic conservation and improvement of the Alexandria forests. East of the Alexandria forests, the coast forests consist of a broken fringe of low growth known as the sea-bush, and of the scrub-lined valleys of the larger rivers, as these approach the coast.

In the valley of the Kowie River there is some thirty square miles of scrub, of which about two-thirds has been alienated to the Bathurst and Port Alfred municipalities. This forest contains trees of from one foot to two feet thick, but with rarely more than six or eight feet of bole. There are many trees of valuable species, sneezewood, milkwood (*Sideroxylon inerme*, *Mimusops obovata*), saffraan (*Olea verucosa*), olive (*Elæodendron croceum*), salliewood (*Buddlea salviæfolia*), pear (*Phoberos*), &c., and here and there, in kloofs, small patches of yellowwood, assegai (*Curtisia faginea*) and black ironwood (*Olea laurifolia*).

East of the Kowie bush is the similar scrub, in the valley

of the Fish River. Here the sneezewood, once abundant, has, over large areas, been entirely cut out by the Peddie Fingoes.

East of the scrub in the Fish River is that in the Keiskama River. Here we begin to find Cape box (*Buxus Kaffer*), though not in any abundance, and the Keiskama valley scrubs are in the same position as those in the Fish River, being burdened with the ill-defined forest rights of predatory native locations.

Further east, in the valley of the Buffalo River, we reach the habitat proper of the Cape box. The East London forests are valuable from their position, between the King William's Town and East London markets, and their surroundings, which are those of a settled country. As the bush on the neighbouring farms becomes cleared, there will be a better market for the wood from the Government forest. The Buffalo valley forests contain much the same trees, as the rest of the coast scrubs, with the addition of boxwood, and two trees, one with an exceedingly hard heartwood, tiza or umtiza, believed to be the same as the umzumbit (*Millettia Kaffra*) of the Transkei and inkobèza (*Nuxia sp.*), a wood which resembles the box, being without heart, very close in the grain and a good seasoner. The objection to tiza is its extraordinary fluted stem, not allowing much more than a stick to be got out of the heartwood. There is between twelve and fourteen square miles of Government forest containing boxwood in the East London division, and about an equal area of forest, in which box probably exists, on farms in the East London division. The discovery of the commercial value of Cape box, has excited great interest. The felling of boxwood for firewood is such a palpable waste that all owners of box forest must be willing to stop the practice. To assist them in identifying the tree, and for distribution to others interested in Cape box, I have before me a number of small representative sections, showing the wood and bark; also some sheets of paper containing the dried leaf and flower of Cape box.

MOUNTAIN FORESTS.

Leaving the boxwood forests, and going twelve miles north of King William's Town, we meet the large high-timber forests of the mountains. These occupy the slopes of the two parallel ranges of the Perie and Amatola mountains. These mountains themselves, with the exception of a few spurs and offshoots, are steps on to plateaux above:

the Perie mountains being a step on to the Stutterheim plain and Evelyn valley, the Amatola mountains on to the high plateau of the Bontebok flats.

The Perie is the lower of these two ranges of mountains, rising from about 1,500 feet above sea level to 3,500 feet. The Amatolas rise from 2,500 feet at the Stutterheim end, and 2,000 feet at the western end to elevations of 4,771 feet and 6,373 feet in Kakalozeli point, and in the Hogsback peaks. The Perie mountain range is the best wooded, the forest usually covering the entire side of the mountains, and sometimes crowning the summits.

To the north of Evelyn valley there is, what is very rare in the Colony, a fine strip of dense evergreen high-timber forest—the Rabula forest—on the northern slope of the mountains. Some of the photos of forest trees, which are to be sent to the Colonial Exhibition in London, were taken in this forest.

In the Amatolas, the forests cease at a general elevation of about 5,000 feet; and, in every case, the summits are bare of forest, but the greater extent of the Amatola range renders the Amatola forests larger and more important than those on the Perie range.

The area of the demarcated Amatola forests is estimated at eighty square miles. There are detached portions of forest on commonages, notably on the Rabula commonage; there is a large area of wild olive forest about the Boomah Pass, which it is hoped may be demarcated and conserved before it is destroyed. Altogether the total area of the King William's Town mountain forests is about 140 square miles. The area of the Knysna forests, in the divisions of George, Knysna and Humansdorp, is estimated by Count de Vasselot, the head of the Forest Department, in his first annual report for 1881, at about 150 square miles. There is an area of about twelve square miles of forest in the Stockenstrom division. Thus, as far as our information extends at present, the Eastern mountain forests and the Knysna forests are each about 150 square miles in area.

EASTERN MOUNTAIN FORESTS.

AMATOLA FORESTS.

Forest on the Main Chain of the Amatolas, going from East to West

Name of Forest.	Estimated Area in Square Miles.	Civil Division.	Remarks.
Quacu Forest ...	2·5	Stutterheim.	Area by survey.
Kologha ,, ...	16	ditto.	Area estimated from the lithographed plan of the Colony from partial surveys made by the Forest Department and from personal knowledge of the ground.
Dontsah ,, ...	5	Stutterheim and King William's Tn	
Hohwald ,, ...	9	King William's Tn.	
Kata ,, ..	8	ditto ditto.	
Schwartzwald do	27	ditto ditto.	
Hogsback Forest	4	ditto ditto and Victoria East.	
Auckland ,, ..	8	ditto ditto.	
Various undemarcated forests	15	King William's Tn.	Very approximate.
Total ...	94·5		

Forests on the Subsidiary Range of the Perie Mountains.

Name of Forest.	Estimated Area in Square Miles.	Civil Division.	Remarks.
Izelini .. / Frankfort / Kwenkwe	4	King William's Tn.	Not yet surveyed. Much cut into by small native lots. Area estimated.
Perie .. / Rabula .. / Gwili Gwili / Isidenge / Gubu ..	40	ditto ditto.	Under survey.
Tabandoda	4	ditto ditto.	Area estimated.
Total ...	48		

Forest on the Katberg Range, West of the Amatola Mountains.

Name of Forest.	Estimated Area in Square Miles.	Civil Division.	Remarks.
Stockenstrom Forests / Various detached Forests	12	Stockenstrom.	Area estimated.

Thus giving a total of 154 square miles, as the area of the Eastern Mountain Forests.—

Amatola Forests	94·5
Perie Forests	48
Katberg Forests	12
Total	154·5

TIMBER TREES OF THE AMATOLA FORESTS.

The following list shows the large timber trees of the Eastern Mountain Forests, arranged approximately in the order of their relative economic importance.

COMMON NAME.	BOTANICAL NAME.	KAFIR NAME.
Sneezewood...	Pteroxylon utile	Umtati.
Outeniqua, or Common Yellowwood	Podocarpus elongatus	Inquobaza or Umkoba
Upright Yellowwood	Podocarpus latifolius	Umceya.
Black Ironwood	Olea laurifolia	Igqwanxe.
Assegai	Curtisia faginea	Umgxina.
White Ironwood	Vepris lanceolata	Umzani.
Trichocladus, or Onderbosch	Trichocladus crinitus	
Saffraan	Elæodendron croceum	Umbonwaua.
Milkwood	Sideroxylon inerme	Umqwashu.
White Pear...	Pterocelastrus rostratus	Umdakana.
Beukenwood, or Wild Beech	Myrsine melanophleos	Isigwane isqlati.
Wild Olive, or Oline	Olea verrucosa	Umquma.
Red Els	Cunonia Capensis	Umqwashube.
White Els	Platylophus trifoliatus	
Kafir Plum...	Harpephyllum Kaffrum	Umgwenge.
Red Pear	Scolopia Ecklonii	Iqumza.
Red Stinkwood	Brabejum stellatifolium?	
Hard Pear	Olinea Capensis	Umnonono.
Natal Mahogany, Blinkbar, or Wild Peach		Uveti.
Salliewood	Buddlea salviæfolia	
Camdeboo Stinkwood	Celtis rhamnifolia	Umvumvu.
Wild Chestnut, or Castai...	Calodendron Capense...	Umbaba.
Essenwood	Eckebergia Capensis	Umkwenyuzinja.
Thorn Pear...	Scolopia Zeyheri	Iqumza elinameva.
Wild Lemon	Grumilea cymosa	Lamuni.
Boerbone, or Boer's Bean	Schotia latifolia	Umgxam.
Cape Plane	Ochna arborea	Umtensema.
Silk Bark, or Zybast	Celastrus acuminatus...	
Horsewood, or Paardepis...	Hippobromus alata	Uningambila.
Candle, or Kersewood	Pterocelastrus variabilis	
Erythrina, or Kafir Boom	Erythryna Kaffra	
Knobwood, or Paardeprom	Xanthoxylon Capense	Umnunga mabele.
Wild Fig	Sycomorus Capensis ...	

It is probable that the forest on the Amatola and Perie mountains is the most valuable in South Africa. The Natal forests, in great part destroyed, have been closed for the last two or three years. There are fine forests in the Transkei; but, as far as my information extends, there is no group of forests equal to those on the Amatola and Perie mountains north of King William's Town. Those that are larger in area have smaller timber, and those containing equally large timber are smaller in area. The Knysna forests, once indisputably the best in the Colony, have been

reduced by alienations and by fires following on unsystematic working, to a fraction of their former area. The Knysna forests are now about equal in area to the King William's Town forests.

Comparing the size of the trees in the two groups of forest, the largest recorded measurements come from the King William's Town forests. [The diagram used at the delivery of this lecture exhibited the diameter (11½ feet) of a tree I had measured recently on the Amatolas. This was a sound tree, in full growth: an Outeniqua yellowwood, *Podocarpus elongatus.*]

There are no comparative figures of average size or increments of growth in the Eastern and in the Western forests. Comparing the average selling rates for timber, a tree in the King William's Town forests is worth four times the same tree in the Knysna forests.

Time, on this occasion, will not permit any detailed description of colonial forests. A portion of the beautiful forest north of King William's Town was described in a recent lecture before the St. Andrew's Literary Society, of that town. In the catalogue accompanying the collection of Cape woods, being sent to the Indian and Colonial Exhibition, there will be a description of the Cape forests, and of the woods that are in them; so I must refer you to these, and proceed to discuss certain points of general forest management, which it is desirable should be widely understood.

FOREST MANAGEMENT.

I can now only touch in the most cursory manner possible on forest management, as this is understood in Europe; nor, perhaps, is this altogether to be regretted. I should certainly weary you with the discussion of much that a specialist must know, if only to guard against his being led away by every blast of vain doctrine.

On the other hand, there is much that a specialist has to unlearn; for while the broad principles of systematic forestry remain the same in every country, the carrying out of these principles involves widely different methods in different countries.

FOREST FIRES.

The fire-protection of forests, as it is practised in India, is a branch of practical forestry, to which the European Forester is a total stranger. We have seen how much of the improvement that has taken place in the Indian forests, is

dependent on their efficient fire-protection. There is no necessity in this country for the expensive system of fire-paths made in many of the Indian forests. In India, fire-protected forests are cut up like the squares of a chess board, each square being cut off from the next by a broad fire-path, of burnt and sometimes cut grass. In this country it is rarely necessary to do more than to keep an eye on the long grass and rushes, which usually border the forest; and where the forest is in an open, dangerous condition, to burn off this long grass before winter, and when the wind is favourable. In the planting now being done by the Forest Department in the mountains, more extensive fire-lines will, in a few places, be necessary, especially for the protection of the pine plantations. As far as possible we shall make these fire-paths permanent, by planting lines of poplars, oaks, wattles, &c., whatever we find grows up quickest, and forms a clear soil underneath.

But what I will specially bring before your notice now, in connection with forest fires, is this: Forest fires, which have been so terribly destructive to forests in South Africa, are due to no accidental causes, but are the direct result of forest mismanagement.

The forest in its natural state is practically fire-proof. Its very existence in its present state is a proof that it is so. The long grass around it, was burnt yearly, before the arrival of the farmer and his flocks. They did their best to burn the Perie forest in the last war. Natives now light fires in it constantly. Were this forest in the condition of the Stockenstrom forests, it would have been burnt long ago.

What happens before an evergreen forest can be burnt is this: When the axe goes into a forest, it destroys the shade, or what Foresters call the "covert," and introduces an entirely new order of things. Grass and plants, previously unknown in the forest, spring up with the increased light. This ground herbage dries, and the clean forest soil becomes covered with inflammable materials.

You must live in the forest to realize what a bite frost takes in the still air of forest glades and openings. Frost, by night, hot winds and the cloudless winter's sun, by day, soon make the rich vegetation in and around the forest, dry as tinder; then come the fires. Of course, every sane man would take precautions to keep fire from being lit in the forest; but, introduce these conditions, which must follow on irregular cuttings, and a forest is sure to be burnt, sooner or later, unless regular fire-protective measures are undertaken. Old crowns of trees and the litter

of timber working, increase the inflammability of the forest; but the primary cause of forest fires is, the abnormal ground herbage, the direct and inevitable result of irregular fellings.

Again, irregular fellings clear the forest in one place, and leave over-mature old trees and dead trunks in another. A fire which has been lit on a still, cool day, will burn slowly, perhaps do little damage, and be easily extinguished. But the old trunks and stumps will smoulder for days or even weeks. Then a hot wind arrives, the flames burst out afresh, and, fed with the hot wind, sweep through the whole mismanaged property, leaving it a wreck. Here the old trunks and stumps, in keeping the fire alight, till a hot-wind day, are the indirect cause of the destruction of the forest.

If the forest is not in a very dirty state, it may take two or three fires to destroy it. Parts of the Amatola and Perie forests, have been burnt through once or twice, but in only one locality within the demarcated forest, has the forest been destroyed. In the Kat River settlement, on the other hand, nearly all the best forest has been entirely destroyed by fire.

To farmers, and owners of small forest properties, I would say: As far as possible, small patches of forest should be worked systematically, removing the mature trees gradually and regularly, from end to end. Avoid excessive clearing in certain places, especially on the outskirts, where the forest is most liable to get excessively worked.

If your forest is in a dangerous state, protect it for a few years, and it will recover. The old wood will rot, the ground herbage will decay. The forest will close up, and the ground once more become clean, or clothed with succulent non-inflammable vegetation. The division of the large Crown forests into Sections or Compartments for systematic fellings is the work on which the Forest Department is now engaged. In my King William's Town lecture, I enumerated the principal advantages of regular, over irregular forestry in this country. But my experience here is, that regular working is almost the *sine qua non* of forest existence; for irregular working is invariably followed, sooner or later, by forest fires, which destroy the forest altogether.

In India the open deciduous forest is deteriorated, but never destroyed, by the annual forest fires. An annual burning has been a condition under which that forest has existed for ages. When the Forester stops those fires, he introduces an improvement. But in this country the forest is not, so to speak, used to being burnt annually; the trees have not the hardiness of trees which have come into being

with fire, as a part of their environment, and when they burn they are destroyed. It is somewhat surprising, though not peculiar to South Africa, that although the majority of colonial forest trees will re-shoot if cut when young with an axe, yet if the stem is burnt off the root rarely re-shoots.

GRAZING AND FOREST FIRES.

Of a melancholy interest to every lover of forests, and of a special interest to farmers and graziers, on account of their frequent connection, are grass-burning and forest fires. Our brief, imperfect little Forest Act, has a wholesome provision, rendering it penal to cause any fire, which by spreading, shall burn forest. I am not one of those who condemn grass-burning under all circumstances. I am perfectly aware that very often the only way to utilize grass is to burn it. As a Forester, I am of course opposed to grass-burning. No grass fire ever takes place without doing some damage to the forest in the neighbourhood, and it is one of those agents which tend, in South Africa, to keep the sharp line of demarcation, between the dense evergreen forest, where there is no grass, and the open grass lands, where there are no trees.

A type of forest very common in Australia, in India, and in other countries, is the open, park-like forest. Here in South Africa, from the dense evergreen forest—the highest type of forest—we step, as out of a door, on to the open grass lands. The intermediate type of forest with grass on the ground, and scattered trees, is absent; except in the case of Mimosa and Euphorbia bush, which scarcely deserve the name of forest.

This open forest is, in most countries, in favour with graziers. The scattered trees afford shade, and some shelter, to stock; and the partially shaded grass grows less rapidly after rain, but lasts longer than grass which is entirely unshaded. No one will dispute the wide difference between a park-like scene, beautified, shaded, and diversified with scattered trees, and the barren, treeless plains so common in South Africa. Possibly, fresh memories of other scenes, are necessary, to appreciate this difference at its true force—a difference perhaps as great as that which exists between the open, park-like forest and that grand complex world of its own, a dense high-timber forest. But this, everyone here to-day will admit, that his farm would be better, more valuable, both in its timber and in its grass, if it were wooded with scattered trees.

The effect of settling a country is to replace grass fires by grazing. Both are hurtful to trees and forest. Foresters try to get rid of both.

The farmer, when his farm is fully stocked, replaces grass fires by grazing.

Now what is the effect of this on forests? My observation is that, grazing—a thorough grazing, a getting rid of the grass up to the edge of the forest—is less harmful than were the forest fires. Much, of course, depends on circumstances. A flock of goats will clear out every sapling less than six feet in height. But in ordinary circumstances, I have frequently noticed, that in the neighbourhood of the big forests, on the Amatola and Perie mountains, where thorough grazing has replaced grass fires, the forest appears to be slowly extending at the edges. I have noticed thickets of pure Bookenwood or Cape Beech (*Myrsine melanophleos*) along the margin of grazed forests. The Bookenwood tree in the large forests is, as it were, the pioneer species. It is commonly met with along the edge of the forest. It is a splendid seeder, blessed with a strong natural reproduction. And in the struggle for the possession of the land, it is the Bookenwood tree, which pushes out its seedlings, kills the grass, and prepares the way for the growth of tenderer species, requiring shade and shelter, to bring them forward.

Among introduced trees, there are numerous instances showing that, grazing is less harmful than grass fires. The pines, planted on the Graham's Town commonage, are spreading themselves, self-sown. If a grass fire runs through a young pine plantation, it is utterly destroyed. Pines cannot re-shoot, like some trees. Therefore, when a farmer reads or sees, how harmful grazing is to forest, and to young planted trees, he should not be tempted, grazing being his first consideration, to abandon trees and tree-growing, for, in nine cases out of ten, his grazing is less harmful to trees, than were the grass fires before he came there.

FELLINGS SHOULD IMPROVE A FOREST, NOT DESTROY IT.

A subject on which misapprehension exists is this. It is supposed, popularly, that to cut trees destroys the forest; and that the golden rule, the pith and kernel of all forestry is, that where one tree is cut two should be planted in its place. This planting of two trees where one tree is cut, is an idea which seems to haunt the amateur Forester the world through. Magistrates, in reporting on forests, tree-amateurs

everywhere, seize on this point—pass a law that every man who cuts down a tree shall plant two. Laws, to this effect, have actually been in force in various parts of India, under native governments. Now, apart from the fact that tree-felling and timber-working is one man's business, and tree-planting another's, there is the ignoring of the great truth that, every natural forest—to use the French expression—has within itself the elements of *natural reproduction.*

I need scarcely remark that the study of the natural reproduction of each species is the most important point of a Forester's education. If I go into a forest which is in good order, and fell a tree which is fit to fell, I do not thereby damage the forest. I let in the light—and here the light is the life—I let in the light, upon every tree which has been overshadowed by the tree I have felled. I stimulate the germination of dormant seeds in the ground, and introduce conditions proper for the germination of whatever seeds may fall from the trees around. Now, who would think of planting here? Nature is a better planter than man!

The Forester observes and adapts nature to his own ends. In almost all forests, light is the governing factor of forest growth. Admit light, cautiously and according to the wants of the species you are working for, and presently you will see a young forest, in place of the old that has been removed. And this is far from being all. By the choice of seed-bearers and by nettoiements, the Forester can stock his forest, with those trees that are valuable, and stifle and obliterate the rubbish.

I do not here use the expression rubbish, in an absolute sense of the word. Absolutely speaking there is no tree in our mountain forests which has not some value. The noxious cactus-like Euphorbias cease where the high timber forest begins, or I should not hesitate to term them rubbish, with all respect to the good people who will repeat that there is a use for everything, fleas, mosquitoes and hot winds included. We have Euphorbia juice among our exhibits, and I suppose it will continue to figure at all Exhibitions, as long as the Cape Colony and Exhibitions endure. But I am glad, nevertheless, that the cactus-like Euphorbias are unknown in our beautiful mountain forests; and I look forward to the day, when we shall be able to crowd them out of the coast scrubs, by a judicious planting of the hardier pines of hot countries.

Between the relative values of the different forest trees, there is such a wide gap fixed, that the Forester, who, by regulating the fellings, can alter the relative proportion of

the different species in the forest, has in his hands a powerful instrument for good or for evil. He may make a forest intrinsically worthless, by cutting out the grown-up trees of valuable species, and leaving the re-growth to be smothered; or, by regulated cuttings, he may stock the forest with the most valuable species. £800 worth of sneezewood, is stated by the *Cape Mercury*, to have been sent from the St. John's River Settlement to Natal for the Durban harbour works during last year. £800 *worth of sneezewood, felled without restriction or skilled supervision!* The old, sad story of—wholesale waste, and ignorant destruction of one of the resources of the country!

NETTOIEMENTS AND THINNINGS.

Nettoiement is a French forest term, for which we have no equivalent in English; it means a thinning or cutting back of inferior species, so as to allow more valuable species, to grow, to become dominant, and to suppress the inferior species. Thus, if there is a sneezewood sapling under a wild lemon, to cut down the wild lemon, is to stock your forest much more surely and safely, than if you had planted several sneezewood trees. Nettoiements will be a very important branch of work in our forests, as soon as the sectioning is finished, and we are enabled to take the Compartments regularly in hand, for this sort of work.

You will understand how important nettoiements now are, on reflecting that the reverse process, namely, the cutting out of the valuable species, has being going on since the white man came into the Colony. Nettoiements could easily be performed by farmers or other owners of small forests. They are absolutely essential to the improvement of the property. It is of no use sowing acorns, or planting valuable trees, in your forests, unless, at the same time, you allow the light for development. I have seen one tree planted under the shade of another tree, and wonder expressed that the overshadowed tree stood still.

This should be remembered, that you may plant trees, within wide limits, as thickly as you like. When the trees grow up regularly, the pressing of one upon the other will do no harm, and give the trees a good form, but as soon as one tree overshadows the other, then, either the dominated or the dominating tree must go.

The power we possess, in a regular plantation or forest, of moulding the form of our trees is very remarkable. Space for space, you may obtain the same bulk of timber from one

stout tree or from ten lanky ones. Within wide limits the acre-increment or the mean annual growth per acre, is not affected by the number of trees per acre. Other circumstances being equal, the acre-increment is the resultant of the sun's action on a certain leafy surface. Whether the acre of sunlight is received on 50 large tree crowns or on 500 small crowns, does not materially affect the acre-increment; as long as the ground is completely covered, and all the sun power utilized. If there is grass on the ground that is evidence that your trees are allowing sun power to escape them. Thus, with Foresters it is an important point when a plantation or forest closes—when the leafy canopy becomes complete: from that moment all danger of fire is passed, the soil is clean, or carpeted with fern and such plants, usually of a succulent nature, as can grow with very little light: then also the acre-increment is somewhere near its maximum; and we maintain it at its maximum, by judicious thinning. We force the trees to grow good straight stems, and at the same time avoid excessive crowding.

The struggle for existence is sharp in a good plantation. As soon as a tree is dominated by the others, cut it down. As a pole it is worth something: left where it is, it is worthless, or noxious, if it dies, and harbours insects. This sounds merciless, but the Forester must imitate nature. In nature, the weakly individual must perish, or the species will undergo deterioration.

I am here speaking of a perfectly regular plantation or forest, and I need not say, that such never quite occurs in practice. Nevertheless there are plantations in which matters are very nearly as I have described them. In a series of measurements of some blue gum plantations in India, I obtained figures which bore out very strikingly the fact, that the acre-increment and the leaf surface are mutually dependent factors; while the number of trees per acre, and the age of the trees, can vary within wide limits, without affecting the acre-increment, *i.e.*, the production of wood per acre.*

WORK OF THE FOREST DEPARTMENT IN THE EASTERN FORESTS.

The Amatola forests, with small exceptions, have now been demarcated by the Forest Department. A large portion has been demarcated and surveyed. On the Perie

* For those who would care to pursue this subject further, I have some spare copies of the Indian report, in which the figures supporting these conclusions are worked out and discussed. They relate to the most powerful grower that has been studied—the blue gum.

range, where we are now engaged on a forest survey with the plane table and theodolite, following, as far as circumstances will permit, the example of the Indian forest surveys, the forest is being laid out into compartments, for systematic working. This work has been delayed, by the number and intricacy of small native holdings.

It must not, however, be forgotten that there is a large quantity of refuse and over-mature timber, the result of the former system of working, which it is desirable to get rid of at any price. Were these compartments of good timber to be thrown open at once, we should find inferior wood left on our hands. No real advance was made in the practical conservation of the forests, till European Foresters were appointed.

These men live in the forest, in cottages built by themselves, but of which the materials were found by Government. They have ten acres of irrigable land for their own use, and the right of grazing twenty head of cattle in parts of the forest where grazing will do no harm. They have each charge of a nursery, where, with an unlimited command of water, trees can be easily raised and propagated. Each Forester is expected to raise 40,000 trees per annum. Last year, the first after they were appointed, some of them raised more than 40,000 trees each. They are paid £4 or £5 per mensem, and at the end of the year get an allowance, both on the number of trees raised, in the nurseries, and those planted out in the forest.

The Foresters are all Europeans. Their responsibilities, and the traditions of the corrupt native wardens whom they replaced, make it inadvisable that natives or coloured people should be employed as Foresters. I do not ask you to take my bare assertion of the fact that our Foresters have been a success; but if you could inquire from the police, from disinterested persons who have the means of knowing, from the bush-workers themselves; or if you could go and see the forest nurseries, you would find, I think, that no class of men in the country are quietly doing better, more honest, or more solid work than these Foresters. The forests provided with Foresters, are now efficiently and really protected. The pay of the staff of Foresters is the same as that of the native wardens who preceded them.

During the past year, 87 grain bags of acorns, and over 1,000 lbs. of stone-pine seed have been sown in properly prepared ground, in vacant places, in the forest. With the good rains of the present year, there has been produced a quantity of young oaks and pines, that no one in this room

would care to count in a week. At the close of last year, when most of the Foresters had been less than a year at work, I reckoned up the trees in the nurseries to amount to not less than 150,000. Very little is paid for labour or horse allowances. Each Forester has charge of about 14 square miles of forest. The Foresters get occasional labour assistance for such work as fencing or beacon building, but all routine forest work is done by the Foresters and forest Cultivators, and paid by results, on the number of trees, counted by me, at the end of the season, in the forests and nurseries. From 10s. to £1 per 1,000 trees, plus the cost of seed, is a cheap rate, for the country to get its planting done at. But this is actually the total cost. The Foresters must be on the spot or the forest would be plundered. It would be a faulty system to keep them in comparative idleness. We employ them therefore in planting, roadmaking, and nettoiements, besides the general supervision of the forests. But, of course, the manual labour of one man is not much. To assist the Foresters we employ a class of men termed forest Cultivators.

FOREST CULTIVATORS.

These are men, usually natives, without pay, who, in return for the right to cultivate small patches of waste land within the forest, for one, or (at most) two years, engage to work at tree-planting a certain number of days, with the Forester, and to plant trees or seeds in the land from which they are taking their crops.

It has been found that oaks and pines come up remarkably well with a crop of mealies. The tall maize plants, which grow so straight and strong near the forest, act as shelter and what are called "nurses" for the young trees.

The forest Cultivators also frequently render service in reporting forest offences. They are bound to turn out to assist in extinguishing forest fires, and their patches of cultivation, usually in the dangerous long grass bordering the forest, are useful in stopping the progress of forest fires. We sometimes place them in localities where fire would be specially harmful, as in a plantation of young planted trees, or where the forest has been once burnt. They are not placed at a distance from the Foresters, where they might get out of control. Besides the important services rendered by the forest Cultivators in tree-planting, there is the gratifying reflection, that land which would otherwise be waste is cultivated, and employment given to people who without other means of subsistence would probably turn

their attention to cattle or wood stealing. The area of land now under cultivation and reforesting by 88 forest Cultivators is 898 acres.

AN APPEAL.

In conclusion I have to crave your indulgence for just this one reflection: You are the owners, and under parliamentary institutions, the responsible owners of the Crown forests. It is, perhaps, a misnomer now-a-days to speak of Crown forests. In France and India we used the expression "State forests" for the Reserved Government forests. But this is a mere question of name. There is no gainsaying the fact that, in your hands rests now the care and responsibilities of forest ownership. You cannot meet these responsibilities by the mere issue of instructions to the civil authorities. Most of the magistrates have grown grey under a system which has allowed the forests to get within measurable distance of destruction. Some magistrates are enthusiastic forest preservers, others the reverse. The evidence in forest cases must, from the nature of things, be chiefly circumstantial. Direct evidence is not so easily obtainable as where a crime is committed amongst the busy haunts of men. Forests in every country, where they are conserved, require special laws for their preservation; and Cape Colony is no exception to this rule.

The British Government spent five millions sterling on Kafir wars; and the eastern districts of the Colony are the result. You have inherited broad and barren acres; but all across that usually thirsty land stretches the belt of fertile forest country, from near the Kei River to beyond the Katberg—a mountainous country of gushing streams and sparkling burns, where the hot sun of these latitudes is tempered by genial cloud, where nature's mood is changeful, with an ever fresh beauty for the student of Nature, recalling the more highly favoured lands of another hemisphere. Does the hot wind strike you as the blast of a furnace? It is cool within the dense evergreen forest of the mountain. Does the night wind of winter freeze you as it passes? It is tempered within the forest. There, flowers bloom throughout the year; there, is the verdure as of an eternal Spring. It remains with you to determine whether these mountains are to be preserved in the stately beauty of their sylvan scenery, or cursed with the hideous sterility which has overtaken mountains similarly situated in other lands. The love of forest is no mere sentiment. You have but to travel

in other countries with a climate similar to this, to witness, with your own eyes, the evils following forest destruction. Cyprus and the neighbouring Mediterranean countries have been aptly described as a burnt-out cinder. No one who has travelled through Italy, and witnessed its barren torrent-swept mountains, could possibly have two opinions on the matter, knowing, as we do historically, that these same mountains, were once covered with waving forests, and blessed with permanent streams.

A NECESSITY.

What we want in this country is a strong public opinion to second the efforts Government are now making, to rescue and restore the forests of the Colony. We want indeed many things: a good Forest Act, money to fence the forests, more Foresters, and more planting of the grass-lands with the valuable timbers of other countries. But, above all, we want a healthy public opinion that forests *must* be preserved, a final fixed conviction on this point, that brooks no half measures—to spur us all forward; not only us professional Foresters, but Magistrates, Policemen, and all who have anything to do with the administration or the preservation of—the forests of the Cape Colony.

VIII.

THE FRUITS AND FRUIT TREES OF THE COLONY.

By Henry Golding, *East London.*

The generality of people, though they appreciate fruit very much, and may not consider that a dry subject, would soon fidget and yawn over a scientific description of the varieties of fruit trees, and would scarcely care to be told, that the great majority of our hardy fruits belong to the natural family of the Rosaceæ, or that the pomegranate and the guava are myrtles, or that the fig and the mulberry belong to the Urticaceæ. I will, therefore, give as little of this as possible. But as this must be very much in the way of personal experience, you must excuse me if I use the first person singular rather often.

I think I had better mix up the subjects of Fruit and Fruit Trees, not giving a detailed list of all the sorts grown in the colony, but merely a little gossip about the sorts I have grown and met with myself; with a little information culled from books, and especially a few extracts and facts borrowed from Dr. Hogg's "Fruit Manual." Of course, by this plan, I must omit the mention of many choice kinds that are grown in the colony.

We can grow nearly all the hardy fruits of Europe and many of the sub-tropical fruits of Asia and America.

The Apple seems naturally to head the list of hardy fruits, and throughout the colony the apple thrives generally very well. Along the eastern coast, the trees are stunted and do not seem to have any regular season, yet bear an average quantity of fruit, while further from the sea, where the winters are much colder, giving them their necessary season of rest, they grow luxuriantly.

Dr. Hogg enumerates, and describes, 475 varieties grown in England; and the description of many of them makes one long to be able to acquire them. We do not grow many sorts; it is probable the odd 75 would include all our varieties.

In many of the farm gardens but one sort is grown. The tree is strong growing, and produces scanty crops of sweet,

juicy, but not high favoured apples. Where better kinds are grown there is the large green apple, often known as the dumpling apple—it is, I think, an American apple, the Gloria Mundi. Then we have red Quarrenden, one of the earliest, Ribston and other pippins, Golden Reinette, and so on. Some of the choicer sorts, formerly grown here, have quite disappeared in many localities through the ravages of the American blight.

The blight is a small whitish insect, which is found in clusters, imbedded in a sort of cottony material. On crushing them, a reddish fluid exudes. They attach themselves to the stem, branches, and roots; they suck the sap from the trees, and thus weaken them; and when they have been on the tree for some time, they cause excrescences to appear, and the tree becomes unhealthy, and unsightly, bears but little fruit or none at all, and generally dies outright. It is not difficult to destroy the insects on the tree. Paraffine oil and even clay will do that; but the difficulty lies in th re being a fresh supply of insects at the roots; and they spread very rapidly from other affected trees, as at one period the insect is winged.

I see by an article in the Journal of Horticulture that in Australia they are equally plagued with this pest; but they have found there several sorts of apple that are blight-proof; and others that are nearly so. The blight-proof sorts are Northern Spy, New England pigeon, Charlestown pippin, Majeting and Slubbert codlin; while Court Pendu Plat, Gravenstein, Duchess of Oldenburg, and Isle of Wight pippin were so slightly affected as to be deemed worthy of a place in the exempt list. They found it not much use grafting these varieties on stocks which were diseased, or were liable to become diseased. The plan adopted was to take cuttings of the sorts they wished to propagate, of about 15 inches in length, then insert in a slit near the bottom of the cutting a piece of healthy, fibrous root, tie up and plant, no claying or waxing being required; and in the course of a month they had made strong growth and were thriving, healthy little trees.

I may be excused for giving here a little experience of my own in the matter. I had an orchard at Sherwood, in the Queen's Town district, and had collected a number of choice varieties of apples. I noticed one day some white fluffy stuff on one of the apple trees. I knew nothing then of the American blight, and did not dream of danger to my trees, till too late, and it had spread through most of the trees. The trees at once commenced to decline, and in the course of

a few years, the greater part were dead. I think the first to succumb was the Gloria Mundi, but among the dead and dying ones I found two sorts that were not at all affected. I am sorry I do not know the names of either. The one is a medium-sized apple, very sweet, the other a large, sour, green apple, with a red cheek. I subsequently met with two other blight-proof sorts—the one a smallish purple apple, with a dense bloom, the other a late red apple, an immense bearer. I tried the Australian plan of propagation, and succeeded very well. The sweet Boer apple is also blight-proof as far as large trees are concerned, but young trees are very liable to the blight.

Apple trees are generally propagated by grafting on stocks raised from suckers, which, in their turn, produce a lot of other suckers. Some of the sorts will grow from cuttings, in which case you are not troubled with any suckers. I do not think there are many kinds that can be so propagated. I once drove an apple stake into the ground to support a vine, and it grew and soon formed a new tree. They will also grow easily from seed, and if the seeds of choice kinds are used, trees may be produced which are worth propagating, as all the choice varieties have been raised from seed, many having been chance seedlings, but the chances are one to a hundred that the young tree will be inferior to the parent; however, if not worth keeping for fruit themselves, they make good stocks for other varieties.

THE PEAR seems to come next. The range of this is somewhat more limited, as it does not thrive near the coast, at least in the east.

In the generality of Boer orchards there are commonly only two or three varieties grown—first the sort known as the "saffron." This is a fairly good kind, medium size, sweet and juicy, but with no pronounced flavour. They are not grafted, but are grown from suckers that spring abundantly from the parent tree. These take a long time in coming into bearing. Next, but not so common, is a small, sweet, early pear. Lastly the cooking pear, a small, hard pear, late in ripening. When it is dry and nearly with no flavour, it is fit only for cooking purposes. The tree is most prolific, and never fails to produce a crop.

Hogg's "Fruit Manual" describes 575 varieties, each apparently distinct—either in shape, size, flavour, or time of ripening. I imported fifty varieties from England, but only a few of them had fruited when I left the locality. Among them was Doyenne d'Ete, a small, sweet, very early pear; Beune precoce and Beune Superfine, two choice early sorts;

Williams' Bon Chrètien (the "Burtlet pear" of the Americans), a fine juicy, high flavoured fruit; the Tyson, an American variety, a most delicious pear, and producing dozens of fruit on a small tree, not three feet high; the Jargonelle is also a very choice, early fruit; the Chaumontelle, Louisa Borné of Jersey, the Bergamot, Beune Hardi, General Todleben, Madam Treyre, Beune Clairgeau, Tcrelle, Winter, and a number of others. Then we have the large cooking pears: the Calabash, the Cattillac, and largest of all, the Uvedale's St. Germain.

The pear is propagated by grafting on pear suckers, or on quince stocks; by the latter mode for the purpose of having small dwarf trees and to induce early fruitfulness. Many of the sorts of pear will not thrive on the quince in the first instance, but may be induced to do so, if the quince is first grafted with some sort that it thrives on, and then the required sort grafted on that. The pear will not grow from cuttings, but in America they have some of the Chinese varieties which grow readily by that mode. They are of very small account as fruit, being very much like quinces, but would grow very good stocks. The pear can also be grafted on the apple, and *vice versa;* but in neither case do they form healthy trees, and almost invariably die off in a few years.

PEACHES thrive generally throughout the colony, with, perhaps, the exception of a belt along the eastern coast, and in localities where the late frosts are apt to destroy the promise of fruit, such as the Stormberg, New England, Zuurberg, Winterberg, &c. I know in these localities, peaches are planted, and sometimes produce excellent crops. In the majority of gardens all the peach trees are seedlings, consequently the fruit is good, bad and indifferent, most of them being of the latter quality, and among the best, I have not met with any to equal the imported English and American varieties.

Dr. Hogg describes ninety-five sorts, the description of some of which is enough to make one's mouth water, especially when we read of "Exquisite," "Susquehannah," "Stump the World." Of course these are American fruits. Then he tells us of some Chinese varieties: the honey peach, which is said to deserve its name; Shanghai, a very large fruit, with yellow flesh; the flat peach is described as being two and a half inches in diameter and not more than three quarters of an inch thick.

Among the English sorts we have in the colony are the Royal George, the Malta, Dr. Hogg, Noblesse, Teton de

Venus, Gross Mignone, Belle Beuce, Late Admirable, and others.

Our late cling-stone peach, commonly known as the St. Helena, or apricot peach (and of which there is a loose stone variety) is probably the best of peaches for making jam or preserves. It seems to be a distinct variety of peach, the foliage being quite distinct from all other sorts. It is probably a Chinese variety, which came to us by way of St. Helena. I cannot find it in any of the English or American fruit lists. It generally comes true from seed, though sometimes a paler colour and tinge of red show that its flowers have been fertilized by some of the common varieties. I have an English sort which resembles it in many respects—it is the "Salwey." It is a very large yellow loose-stone peach, skin yellow, with a red cheek, flesh very rich, deep orange, very red round the stone; it is about a fortnight later than the St. Helena.

I met with in the Tarka, a very fine large late peach—known there as the April peach, from its ripening in that month; it is a cling-stone, with red cheek and very firm flesh. The Parie de pompon of the English description is very like it.

In the Free State they have a red peach with red flesh, which is said to have been raised from a peach stone found in a bag of coffee. There is a similar variety, known in England as the "Sanguinobe."

The "November, or Uitenhage peach," seems to be a valuable acquisition, as it is the earliest peach known. The fruit is small, and the tree differs from other kinds in commencing to flower early in the winter, and continuing a succession of flowers till the spring. The original tree is said to be a chance seedling found at Uitenhage, hence the one name; and as the fruit ripens in November, the other.

THE NECTARINE is said to be merely a peach with a smooth skin; and this seems to be correct, as peaches and nectarines have been found on the same branch, and from peach stones nectarines have been raised, and *vice versa*. There are comparatively but few varieties of nectarines. I recollect when one only was generally known—a late red cling-stone, very firm; now we have various loose-stone varieties, some among them being yellow-fleshed, among the choicest of which are River orange, Palmerston orange, Hunt's Tarony; among white-fleshed kind we have Ebrage, Bulgarian; the Stanurek is a very choice variety with sweet pips.

THE APRICOT thrives in most parts of the colony, and

generally produces most abundant crops; as an example of which I may mention one tree, from which I took 3,500 apricots. This certainly was an exceptional crop, and the tree seemed to have more fruit than leaves. This was a seedling tree. As the generality of the sorts grown in the colony are seedling, consequently they are very often deficient in size and flavour, and I have met with none equal to the English varieties I found the following sorts very choice:—Early Moorpark, a fine large early fruit; the Moorpark and the Peach large and excellent; the Kaisha, the Beauge and St. Ambrose, large in size and delicious in flavour; the Breda, a very prolific small variety, of a deep orange colour, highly flavoured, and excellent for preserves; and latest, the Belle de Toulouse, of the largest size. The season of the apricot is but limited, there not being more than a month's difference between the earliest and the latest.

The apricot grows very easily from seed; and without grafting, the seedlings will produce tolerable fruit. But the choice kinds can readily be budded on apricot or peach stocks. In England they are mostly grown on plum stocks; they will not grow from cuttings, and they do not produce suckers.

Of The Plum Dr. Hogg describes 155 sorts—we possibly have the 55 sorts here. One of the earliest to ripen is the New Year, or cherry plum. This is a distinct species from the other plum. It has very slender wood, yet becomes a large tree. It can be readily grown from cuttings, and being tough and thorny makes a good fence or wind screen. There are two varieties, a red and a yellow sort. The fruit, which has much the appearance of a cherry, is juicy and sub-acid, and is produced in abundance when not destroyed by the spring frosts, which, as it flowers so very early, often happens. Early Mirabelle is a small early sort, growing in clusters. River's Early Favourite, Early Orleans, are choice early kinds. The green gage and its varieties, early green gage, Oulin's golden gage, McLaughlin's gage, Imperial gage, transparent gage, and late green gage are the most delicious of plums. The Orleans, Kirks, Mitchelson's Washington, Imperial, de Milan, Prince of Wales, Montfort, Diamond, Belgian purple, Magnum Bonum, are choice mid-season varieties. Coe's Golden Drop and Blue Imperial are very late and very good. Plums generally do best budded on peach stocks or on the cherry plum. Some of the sorts will grow from cuttings, but not many. Very nice trees may be raised by layering.

The Fig grows well throughout the colony, excepting where the frosts are too severe. Generally there are only three or four sorts grown. There is the common brown fig, which is too well known to need description, and which always bears most abundantly. Then the small black sort, which is early and bears well. Then there is the green fig, which is early and very sweet; when ripe it is pale green. I think it is identical with white Marseilles. Lastly we have the large late kind, which is known as the Adam fig. This seldom produces a first crop, and the second is often too late to ripen, but when it does it is a very fine fruit—large and luscious. I imported a number of sorts; some of them have turned out very good. The brown Turkey, the Brunswick, and the brown Ischia are great bearers, and are somewhat like our brown fig. Bondaa precoce I find a good fig, and great bearer. Ronde Noir has round, black figs of medium size. Early Violet is the smallest of figs, but most prolific. Jerusalem, Castle Kennedy, Bourjagotte blanc, Angelique, and black Ischia are described as being very fine, but they did not fruit while I had them. The Smyrna is said to be a very fine kind, but I have not seen it in fruit. The Albany, a variety raised in the colony, is a very fine large sort.

Hogg describes 70 sorts, some, to judge by the description, are much in advance of the sorts we have.

The fig is one of the easiest trees to propagate, as they grow readily from suckers, which are produced too abundantly; and cuttings seldom fail to grow. The sorts can also be grafted on each other.

Grapes.—I think if we were restricted to one fruit the grape would be the choice; and it is probably of more economic value than all the rest of the fruits. But whether we should not be better without the juice of the grape is a moot point, at least the Good Templars tell us so. Grapes for manufacturing purposes are principally grown in the West, where the vine seems to find its most suitable soil and climate—the wet winter and spring, and dry summers being just what it requires; and at Constantia it seems to have found the special soil that best suits it. Graaff-Reinet, Cradock and Queen's Town can show some specially fine fruit, but near the eastern coast, the vines are very liable to mildew.

Dr. Hogg describes 143 varieties, all of them choice sorts; but we may not have them,—at least while the phylloxera scare lasts. Of course, we have a number of the sorts described, and some choice ones that do not appear in his list.

My earliest recollection of a vine and grapes are of one

that grows over a porch over my father's door. They were the smallest bunches and the smallest grapes I have ever seen, but, as far as my recollection serves me, they were very nice. Mr. Pike, of Clumber, has, I believe, still got the variety.

I think the grape we could least afford to miss is the "Hanepoot" (Muscat of Alexandria), since from it our raisins are made, and it is also one of the best for eating. Besides being firm of flesh it bears carriage better than any other kind. There is a red variety which differs only in colour; there is also said to be a black (Muscat Hamburg), but I have never met with it. I think the black Hamburg is the next best grape. This is how Dr. Hogg describes it:—"Bunches large, broadly shouldered, conical, and well set; berries roundish, oval; skin thin, deep blue-black, with blue bloom; flesh rather firm but tender, very juicy, rich, sugary, and highly flavoured."

Of the early kinds, white and black Muscadel are small but sweet and highly flavoured. Black Cluster and Royal Muscadine are choice and early. White Nia is a very strong growing, hardy kind, large in bunch and berry, but not of high flavour. Bunches of this variety have been grown of 18 lbs. weight.

White Chasselas is a good, late kind, large in bunch and berry, firm and sweet, vine a very strong grower. The "Crystal" is a fine late grape, small in bunch, but large in berry, these are semi-transparent; it is not a good bearer. I raised from seed a vine, the fruit of which was very like this in appearance; it was equally rich and sweet, but very early instead of late. The black Barbarossa is a large showy, late grape. The black Persian is a very late grape, but unless the berries are thinned they crowd each other so they cannot come to full perfection or ripen properly. The white and black acorn are shewy grapes, long and oval in shape. The "Syrian,"—this is supposed to be the variety brought from the promised land by the spies. This is how Hogg describes it:—"Bunches immensely large, berries large oval, skin pale yellow, flesh firm and sweet. This produces bunches from 7 to 10 lbs.; one was grown at Welbeck weighing 20 lbs." I grew this variety, but with me it was nearer that number of ounces instead of pounds. I had also the "Sultana," which produces the Sultana raisins. I found it a delicate growing sort, also the "Black Corinth," from which the dried currants are produced. This grew better, but could not be said to thrive. I also grew for a number of years one of the American vine, the

Catawba, but it never throve, and only produced a few small bunches. I am told another sort, the "Strawberry Grape," grows and bears in Uitenhage. There is one American variety which would probably thrive here—the Scuppernong (Vitis Vulpina), which produces immense crops of large grapes though but few in a bunch.

Vines grow so easily from layers or cuttings, that there does not seem to be much need for grafting them, still it is an advantage sometimes; the difficulty being to hit on the right time, so that the vine will not bleed, as if it does, there is no hope of a union; the best time is said to be when the first leaves have expanded, the scion having been kept back. I succeeded in grafting before growth had commenced, by grafting the middle of the scion and inserting the base in a bottle of water.

Vines from cuttings often show fruit the first season they are planted, but not the second. The explanation of this is, the fruit-buds are formed one season, and developed the next, consequently the buds on the cutting were formed while on the strong parent vine, the weakly year-old not being able to form them, while it grows strong enough the second season to form fruit buds for the third.

ORANGES not being quite hardy will only thrive in favoured portions of the colony; they will stand several degrees of frost, when the trees are of some size, but it is always advisable to give them protection for a few years. The lemon is less hardy than the orange, while the naartje is the hardiest of all. The orange is easily grown from seed, and the great majority of orange trees grown here are seedlings or layers from them, and fair ordinary oranges seem invariably to be produced; though the trees take a long time to come into bearing, layers from bearing trees soon produce fruit.

Risso, of Nice, the great authority on the orange tribe, describes 43 varieties of sweet orange, 32 of the bitter or Seville orange, 46 of lemons, 17 of citrons, 6 of shaddocks, 8 of limes and 5 of Bergamottes. Well, we are a long way behind that list, still of the improved European varieties, we have the Blood, the Nipple, the St. Michael's, choice varieties. The orange naturally forms a conical head, and looks and does best when the lower circle of branches touch the ground, as the shade tends to keep the soil moist, and the sun cannot scorch the stem. The best sample of such trees that I have seen, are at Mr. Pike's, at Clumber. They form perfect cones of verdure, and one can enter, and easily climb to the top, the inner

portion having been so cut and trained as to leave them quite open in the centre.

THE NAARTJE, or Mandarin orange, we have but in two or three varieties; it is naturally a smaller growing tree, and forms more of a bush than a tree. The trees are very prolific, which tends to prevent the growth they otherwise would make. The TANGARIRO is a sort nearly allied to the naartje, much like it in growth and appearance, but not equal to it as a fruit. Of the LEMON we have but few sorts; there is one variety with a sweet juice. The tree is not so handsome as the orange, and does not make so much growth owing to its producing so much fruit; the tree fruits sooner from seed than any other of the orange tribe.

THE SHADDOCK is a strong growing tree, and bears abundantly, but the fruit seems to have degenerated very much; the berry is mostly sour and bitter. While the shaddock is in its native clime, the fruit is very large, sweet and pleasant. The Pamplemousse and the Forbidden Fruit, are sorts of it. The shaddock makes an excellent marmalade or preserve, when the bitterness is first soaked out of the fruit, but that takes about a week, changing the water every day, or better still, if put in a running stream.

Our CITRONS seem also degenerated, as most of them have only a thin skin, and are only larger lemons, but probably there are some of the choicer kinds in the colony.

The LIME seems to thrive, but is not grown to any extent.

The orange tree is liable to die off suddenly without any apparent cause. The tops commence to wither, and in a short time the tree dies outright, while nothing can be seen in tree or roots to account for it. Mr. W. Bower, of Queen's Town, had a fine orange grove destroyed in this way, and I understand that in Graaff-Reinet, some thirty years ago, the orange trees died off in the same way. The scab insect is very troublesome when it once gets possession of a tree, infesting stem and branches, leaves and fruit. This can, however, be destroyed by syringing the tree with a mixture of paraffine and soft soap mixed with water. The black fungus is also sometimes troublesome, but I think sulphur would cure that.

ALMONDS grow readily enough throughout the colony, and generally seem to bear very well, but owing to their early flowering they are apt to have the fruit destroyed by spring frosts. The sorts grown seem to be invariably seedlings, and do not seem to vary much in size or quality;

some, however, have soft shells. When planting the pips there is no certainty whether sweet or bitter fruit will be produced; it would be well if we could get out some of the choicer varieties. The Sultana and the Pistache are described as choice sorts, and the Jordan almond would be a valuable acquisition. I met with a hybrid between the peach and the almond at Burghersdorp, that showed the cross with the peach; the fruit much like an ordinary almond in appearance and taste, but the time of flowering was retarded, thus giving it a better chance against spring frosts. Hogg describes an hybrid variety which has edible flesh like a peach, but with somewhat of a bitter flavour.

WALNUTS are grown throughout the colony, and I think thrive everywhere, but, as a rule, I think they bear but sparingly. The sorts we have seem to be all seedlings, and vary little in size or quality. Ordinarily the walnut, when grown from seed, requires a number of years growth to come to a bearing state, but in England they have a dwarf prolific variety which fruits when only two or three feet high, and which comes true from seed. They have also a late and a thin-shelled sort, besides the double or large-fruited variety, which is more than double the size of an ordinary walnut; the shell is thick and of a somewhat square form. This variety can only be propagated by layers or grafting, which, with the walnut, is a somewhat difficult matter.

QUINCES.—This is one of the most common of fruits to be found everywhere throughout the colony. We seem to have but two varieties, the common pear-shaped and the yellow-fleshed. This is a smaller sort, rounder and more woolly, the flesh orange-coloured and sweet. In England they have an apple-shaped variety and the Portugal, which is a superior sort and is distinguished by turning bright red when cooked. Quinces, owing to their easy growth from cuttings and from their toughness, form very good fences, besides bearing good crops of fruit. I have raised a number of seedling quinces, but they seem to take a long time in coming into bearing, and I have not yet seen any fruit from them. The quince makes an excellent jelly and very fine preserves.

POMEGRANATE.—The pomegranate is commonly grown in hedges, which is not the best mode, as they do not make a good fence, nor do they bear so well as when grown in single bushes. Pomegranates vary considerably, some being very large and showy with bright red skin, others less in

size and of a dull green, but these latter are the best for eating purposes, having larger and more succulent pips than the more showy kind. I raised a number of sorts from seed of the latter variety, and though some of them were very fine, showy fruit, none were equal to the parent for quality.

LOQUATS.—The loquat is a robust evergreen tree, with large shiny leaves, making a dense shade. It is a native of Japan. Though the tree itself is quite hardy, yet as it blossoms and fruits in the winter, it is very apt to set the fruit injured or destroyed. The fruits are produced in clusters at the ends of the branches, and are yellow in colour, about the size of a walnut, of a sweet, sub-acid flavour, having one or more large pips. The trees are generally grown from pips, which grow readily if fresh, but they require shade from the sun, or they will be scorched off. Seedlings under the parent tree grow very well; they can also be grafted on the quince, to which they are nearly allied.

MEDLARS.—The medlar grows very easily grafted in the quince, and I have found difficulty in propagating them in any other way. There are two varieties. The Nottingham, which is the smallest and better flavoured variety, and the Dutch, which is larger and coarser. The fruit comes when nearly all else is down, otherwise it would be but slightly valued. The fruits are not fit to eat when first picked, but have to be kept till they soften, when the flavour is something like that of a cooked quince.

THE MULBERRY.—The black mulberry seems to thrive throughout the colony, and never fails to produce a good crop of fruit, which are black or dark purple, about an inch in length, and ripen in succession. The fruit is too soft to keep or bear carriage well. There seems to be but one variety, though there are numbers of varieties of the white and red mulberry. These are scarcely worth growing for fruit, as their fruit is sweet and insipid. However, they are not altogether bad in jam or tart. The fruit varies in colour from dark red to white. The black mulberry will grow from cuttings, but not freely; layering seems the best mode of propagating. They can be grafted on the white, which grows very readily and quickly from cuttings, but there is some difficulty about it, as I failed entirely. I also tried budding, and the buds looked promising for a long time, but never took. The black mulberry makes but slow progress while young, but eventually, when the conditions suit, it becomes a very large tree, yielding an abundance of fine fruit. I met with some fine old mulberry trees on the banks

of the Tarka, growing in a deep alluvial soil, with plenty of water. The stems were short, each dividing into five or six branches, and each of the branches would have made a large tree.

The Chestnut.—The Spanish chestnut ought to thrive in the colony, the climate being so much like that of Italy, where it luxuriates, and, I believe, it is grown to a limited extent in the West. I had a small tree for a number of years, but it never throve or bore fruit, and eventually died.

Strawberries grow well in any part of the colony when *cultivated*, but that seldom happens; however, it fruits with very little attention. I think among the sorts grown Trollope Victoria suits us best; the red and white Alpine are occasionally grown.

Raspberries are grown very sparingly, and I have never seen them in fruit—probably the colder districts would best suit them.

Sub-Tropical Fruits.—These can only be cultivated with great success in a narrow belt along the coast, where frost is unknown or very slightly.

Bananas are grown in sheltered kloofs along the coast, away from the sea. They require to be grown on higher ground, as a few degrees of frost destroys them. It would not do to plant in low lying grounds, where the frost is always most severe; in any position they require shelter from the wind, as the leaves are easily torn and destroyed. I think forty or fifty miles from the sea is the limit in which they can be grown; and then only in specially favoured localities.

There are but two sorts usually grown—the plantain, whose herbaceous stem, composed of the folded bases of the leaves, reaches twenty feet in height, but so soft as to be easily cut down with a knife. The bunch of fruit, which in favourable circumstances is very large, is composed of a number of cucumber-shaped fruits hanging loosely in the bunch. The other, the dwarf banana, only grows about six feet high, and produces very large bunches of densely packed fruit; the fruits are much smaller than the plantain, but much more highly flavoured. Each stem bears but one bunch of fruit, and then is cut down or dies down to the root stock; however, in the meantime several suckers have been growing to take its place, and by the time the fruit is ripe they are more than half-grown—one or more of these are left for the next year's crop, and a younger crop of suckers succeed them. The same stock will continue in bearing a number of years with undiminished vigour, if assisted by the liberal use of manure. The fruits

ripen in succession, commencing with the lower ones. As soon as the fruit is ripe the bunch may be cut and hung up, and the rest will all ripen, though with scarcely the flavour of those allowed to ripen on the plant; but the birds and the monkeys have each a taste for the fruit.

THE PINE APPLE grows on a small aloe-like plant, with narrow, succulent, prickly leaves. It can only be grown near the coast, as it cannot endure frost. It is propagated from suckers, which are produced on the parent plant as soon as it fruits. The young plants will produce fruit in two years. The parent plant, after fruiting, can have all the suckers but one or two removed, and will continue bearing for a number of years, if treated in the same way, the stems which have borne fruit being cut off.

Our pines are but small, the largest seldom bears more than 1½ lbs., so we cannot think of rivalling the West Indian or English hot-house fruits of 10, 12 and 14 lbs. There are some soils on which they will not thrive—others in which they luxuriate. As an example of the latter, there is a place in Wilson's or some such party—it is at Mr. Purdon's—the soil there is a deep red loam on high ground, I may almost say on a hill top. On this soil they grow luxuriantly, while nowhere else in the neighbourhood did they make more than a very moderate growth.

THE GUAVA.—We have the large fruited white and the small fruited purple sorts. They thrive well and produce a large quantity of fruit, and ripen in the spring, when fruit is scarce. There is a large fruit-eating bat, which is very fond of the fruit, and very destructive, as it comes in flocks, and does not wait till the fruit is ripe. As the bats commit their depredations at night, they are not easy to destroy. They have the habit of taking the fruit from the tree on which it is grown and eating it on some chosen tree, under which the seeds are left in heaps.

The guava is very easily raised from seed, transplants readily, and soon comes into bearing.

THE GRANADILLA will stand a few degrees of frost, and being a climber, it can easily be protected against a wall, when the frost would otherwise kill it. It produces an abundance of dark purple fruit, the size and shape of an egg. It has a very pleasant flavoured pulp, enclosed in a tough husk. The seeds are numerous and dark-brown. The fruit makes very nice tarts or jam.

Seedlings grow easily, but young plants are very apt to die off when a few inches high. Cuttings will sometimes grow, but the best mode of propagation is by layers.

THE PAPAW is more a shrub than a tree. It very much

resembles a castor oil plant, the leaves being very like in size and shape, but it does not branch out like that shrub. It belongs to the Cucurbitaceæ, grows very rapidly, and comes early into bearing. It has clusters of yellow flowers, the male and female being on different plants. The fruit much resembles a squash, has a softish pulp with numerous small black seeds; the fruit is used green as a vegetable. As a ripe fruit it has not much to recommend it, but it makes one of the most delicious of jams.

THE CUSTARD APPLE, in one or two of its sorts, is grown to a limited extent; the tree is an evergreen, not difficult to raise from seed; the fruit is oblong and scaly; the pulp has a pleasant flavour, with a number of brown seeds.

WILD FRUITS.

I think a few words may be appropriately said about the wild fruits of the colony.

THE CAPE GOOSEBERRY (Physalis Peruviana) grows wild in many parts of the colony, though it is not the *Cape gooseberry* after all, being a native of Peru; however, the name will probably stick to it to the end of the chapter. The Cape gooseberry—is it necessary to describe it?—is a herbaceous perennial shrub growing two or three feet high, the fruit concealed in an inflated capsule. The fruit is round, yellow, about the size of a marble, with a pleasant, sub-acid flavour; makes the most pleasant of puddings and pies, the most delicious jam, jelly and preserve. Along the coast the plant is evergreen; generally elsewhere the plants are killed down to the ground in the winter, but grow again from the stock in spring.

THE PRICKLY PEAR (Opuntia Vulgaris) is a very thorny shrub, with broad, flat, succulent leaves. Although the plant is widely spread, and in some localities has taken entire possession of large patches of ground, it is not a native, being from South America, though it probably comes to us by way of Europe. The plant is extremely hardy and thrives on the most arid soil, never failing to produce an abundant crop of fruit, which is sweet and pleasantly flavoured, but defended by a quantity of very harmless looking but really formidable prickles. They tell how the soldiers on first arriving at Fort Brown (where the fruit abounds) took in their hands and filled the bosoms of their shirts with the nice looking fruit, soon to find they had caught a tartar.

THE WILD GRAPE (Vitis capensis, Th.) grows in kloofs

along the coast, not extending far inland ; it is an evergreen, with dark shining leaves, climbing to the tops of the trees. The grapes are black, round, medium sized, and grow in small clusters ; when quite ripe they are pleasant eating, till then they are very harsh and astringent ; they make a fairly good jam, resembling black currant.

THE HOTTENTOT FIG (Mesembryanthemum edule), what a name, or rather what a pair of names! The plant is a trailing evergreen, with succulent leaves, and has pretty pink flowers which open in sunshine and are followed by a pleasant scented fruit full of small seeds, with very much of a strawberry flavour. It grows along the coast, not extending far inland from the Cape eastward. It will not stand many degrees of frost, and some I tried to grow in Queen's Town were killed by it. It ripens about Christmas, and forms a welcome addition to the fare of picnic parties at the sea.

THE KEI APPLE (Aberia Caffra) can scarcely be called a wild fruit of the colony, as it is only found to the eastward of the Kei. The tree, which is close growing, tough and thorny, makes an admirable fence, for which purpose it is grown in the colony. The fruit, which somewhat resembles an apricot in appearance, is generally considered to have an unpleasant flavour as a fresh fruit, but it makes a tolerable jam with plenty of sugar.

CAPE CRANBERRY (Douyalis rhamnoides) is a nearly allied plant to the Kei apple, but a much better fruit, which makes very nice cranberry jam ; it is no connection with the cranberry over the way.

THE NATAL PLUM (Carissa grandiflora) is a wild fruit growing along the coast at Natal, and thrives when cultivated along the coast here. It is a thorny evergreen bush ; it produces fruit about the size and shape of a plum, which is milky, with a pleasant flavour ; it makes a jam very much resembling black currant. It can be readily grown from, seeds or layers.

THE KAFIR PLUM (Harpephyllum caffrum) is a fine large, handsome evergreen tree. It grows in the kloofs and forests, and produces bright red fruit about the size and shape of a large acorn. They have a pleasant, sweet, sub-acid flavour, but too much of the fruit is occupied by the stone. They ripen about Christmas. Stout poles of this tree grow readily, and soon form a fine head.

THE BRAMBLES, in five varieties, are spread thinly throughout the colony. In colour they are yellow, black and purple. The latter, which is the largest fruit, grows

abundantly on the Katberg. They are easily cultivated, and produce an abundance of fruit.

Choice Fruits.

There are some choice fruits, which we have not got, which our climate would suit, and which it would be very desirable to introduce, could we be allowed to do so. Perhaps when the Phylloxera scare has abated, and people here have become reasonable, when they do not expect that the Phylloxera, which can only live on the vine, will be found on the potato, or lurking about the tubers of a dahlia, or hiding in an Indian corn cob, or concealed in a pine apple, or tea plant from Natal; when we can see and act reasonably in the matter, we may be able to introduce them. I will mention some of the desirable kinds. It is quite probable that some of them may be already introduced.

The Japanese Persimmon (Diospyros Kaki) is a fine showy fruit, somewhat like an apricot but larger, the flavour being somewhat like the mixture of apricot and medlar. The fruit is useless till quite ripe. Four varieties of it have been introduced into England, and I had ordered them when the importation of plants was stopped. They are growing and fruiting in California.

The Lee Chee and Longan (Euphoria Litchi and E. Longan).—Two choice Chinese fruits, which probably would be quite hardy.

The Kumquat (Citrus Japonica) is a very small variety of orange, which is hardy and grows in the north of China, where it is too cold for the ordinary orange to live. It grows in the form of a small bush, studded with numerous small oranges. They are to be found in the Chinese preserves. It would probably thrive in the greater portion of the colony. The kumquat has fruited in England. This I was also about getting out.

The Jujube (Zizyphus vulgaris) grows in the South of Europe and North Africa, and is a pleasant flavoured fruit. It is from this fruit that jujubes are supposed to be, but are not, made.

Eugenia Jambos (the Rose Apple) I think has been introduced.

E. Ugni is said to be a desirable fruit.

The Custard Apple has been mentioned. There are two other varieties, also from South America, which would be desirable—Anona Reticulata and A. Squamoso.

Mammea Americana is a South American fruit; it has a leathery rind, containing a bright, yellow pulp, with a pleasant taste and sweet, aromatic smell.

IX.

VITICULTURE.

By Baron A. von Babo, *Viticulturist to the Colonial Government, Cape Town.*

The attention which is paid to viticulture, as one of the principal natural resources of the colony, is daily increasing, and such measures for the development of this branch of agriculture are now being taken, as will render the wine-industry really useful to the whole colony. This object can only be achieved by producing an exportable article.

With this object in view many a wine-farmer, and wine-merchant, has already made experiments; and ever so many materials have been added to the wine for keeping it, which, in most cases, have not tended to improve the health of the consumer, and the wine was made worse instead of better by these experiments. It is altogether wrong and objectionable to try to gain, by such means, an object which can be obtained so easily in a natural way, if only some common sense be used. All these secret means to preserve wine are useless; and whosoever employs them only shows his own ignorance of the subject. Prescriptions of different materials are pernicious.

There are companies started which use certain prescriptions as the basis for fabricating wine, which is to gain a world-wide fame and reputation, and is to fetch a tremendous price. If now an enterprise of this sort collapse, the excellent Cape grape is blamed. Those poor Cape grapes are then said to be too bad for making wine, and all possible and impossible faults are assigned to them, which only prove that those who invent or believe in them have not the remotest idea of the making of wine. If it be explained to these people that there are certain definite laws of nature, according to which the making and maturing of wine take place, they are unable to understand these explanations, and to grasp the practical value of the same; and they always utterly fail to disprove them.

It is quite impossible to learn wine-making from books. The books are of value only to those who have, already, a practical knowledge of all the rules and principles of wine-making.

The following brief account of the treatment of the vine, and the making and manipulation of wine, can of course only touch on the principal points.

In planting a vineyard on a piece of ground which has not been used for this purpose before, it is necessary, first, to ascertain its site. In order to see whether the site is good, it should be compared with vineyards in the neighbourhood. If they are wanting, it is much more difficult to arrive at a correct opinion on this important question. In the latter case, the local climatic conditions must be ascertained; also, whether the site is exposed to inundations, what are the prevailing winds, &c. But if other vineyards are near, they can be examined; and any faults discovered in them must be avoided, as much as possible, in planting the new vineyard.

The first point which must now be settled is, whether the new plantation will pay, and a calculation must be made of all expenses incurred for buying and preparing the ground, for planting the new vines, and for working the young vineyard, as long as it does not yield any produce, &c., &c. The figures will give an idea of what the value of the produce must be to cover these expenses, and to leave a certain profit. The value of the produce depends upon the productivity of the vineyard, and upon the current market price—the latter again being influenced by the distance from the market, and the means of conveyance. The nearer the railway station the better for the wine farmer, because wine is not so valuable an article that it can stand a long transport by wagon. In the latter case wine-growing does not pay, unless the wine is made into a *first class*, and therefore, valuable cognac, which can stand the transport.

From these considerations we can draw the conclusion that, in the wine districts near the railway, wine-making will pay; and that in the "unrailed" districts, it is preferable to make cognac. Brandy, Cape smoke, as it is generally made in the colony, does not come into account at all, as this kind is only consumed in South Africa, for its quality does not allow of its exportation.

In examining a vineyard in the neighbourhood the following points also must be taken into consideration, viz., aspect, quality of soil, humidity of the ground, average summer temperature, and time of harvest; it is also necessary to know the kind of grape which yields the largest quantity combined with best quality. Only after being convinced that the information obtained on all these items is favourable, the spot for planting the vines may be selected. In many cases a northern aspect is the most favourable, whilst in

some localities an eastern or southern slope is preferable. At an elevation of 2,000 feet and with a moderately moist atmosphere, a northern aspect is favourable, whereas at an elevation of between 200 and 600 feet, an eastern or southern aspect would be better.

The examination of the soil refers, first, to its physical condition. Light and heavy soils must be distinguished from each other. The former is valuable in those districts which have a regular and sufficient rainfall; the light sandy soil, however, is unfavourable in districts where vineyards require irrigation. A stiff soil retains moisture longer, and is, on hilly situations, not easily washed away by rain.

The value of the soil, as to its constituents, must be determined by chemical analysis. But as this cannot be always easily obtained, we have to form an opinion on this question by examining the growth of other plants. Also the character of the soil permits us to draw conclusions as to its composition. It is, however, not sufficient to have a soil suitable for growing vines, but we have to pay attention also to this: that the vine withdraws, every year, the very same substances from the soil, which we must return to the soil in the manure. We have, therefore, to pay much attention to the composition of the fertilizers, as good manure has the greatest influence upon the quality and quantity of the production of the vineyard.

Closely connected with the method of manuring is the system of pruning. If a vine is pruned so that it is intended to bear much, the quantity and quality of manure must be accordingly plentiful and good, in order to feed the plant well. With regard to manure, there is one rule, which must always be observed. No fresh manure of any kind should be employed; the manure should be perfectly rotten, and ought to consist of a thorough mixture of vegetable mould and stable manure. There ought to be on every wine farm, several large compost holes, in which all the manure, along with vegetable matter and such rubbish as ashes and bones, rich in potash and phosphate of lime, is accumulated, for the purpose of letting the several constituents decompose together. The mixing of the manure is essential, in order to procure a manure of uniform composition. Every kind of refuse of the farmyard ought to go into the compost holes: leaves, fresh and rotten, blood and ashes, sweepings, &c., nothing should be wasted; the farmyard should always be clean. The mixing and preparing of the compost is to be done chiefly in those months when there is not much work in the vineyard.

The compost holes ought to be made at such a place on the farm, that they are easily accessible and that water may be led on to them during the summer months. By keeping the compost moist, the rotting of all the ingredients is much promoted ; care must be taken, however, not to saturate compost too much with water, but only to keep it moist.

The use of fresh manure does not only involve a loss of some of the constituents of the manure, but also acts most injuriously upon the quality of the produce, inasmuch as the roots absorb, from the fresh manure, certain compounds, which impart to the wine a peculiar flavour as well as taste.

A regular system of manuring, adapted to the conditions of the soil, will provide the vine with all those materials, which it requires for forming all the organs of the plant. The first manure should be put into the ground when it is prepared, by trenching, for the first plantation. At this time the manure is put at that depth where the growing vine-roots want it. To manure at this stage is of absolute necessity when old vineyards are replanted, because the old stalks have impoverished the subsoil, particularly. Whenever larger plantations are to be made, it is necessary to provide space for broad main and branch roads, as this greatly facilitates the work of cleaning and manuring the vineyards.

The next step to be taken is the preparation of the soil for the young cuttings. It is well known that the vine, like all plants, takes a portion of its food from the soil. The compounds which the roots absorb are, however, not in that condition in the soil, in which they can be absorbed by the roots, and require first to be changed by the action of air, moisture, and changes of temperature into that state in which they are soluble, and acceptable to the roots. This object can be best attained by trenching the ground. By this operation the physical condition is also favourably altered, the ground is lighter, the roots meets less resistance in spreading through the soil, and a larger mass of ground is thus rendered tributable to the young vine. In such soil the roots go deep, and thus become independent of the changes of temperature, and of moisture and of dryness on the surface, the growth is more regular, the vine will be more healthier, and the whole constitution of the plant will be firmer and more vigorous. The fibrous roots, near the surface, only feed the plant so long as they are moist. In dry seasons they are useless, and their existence would be fatal to the vine, if the lower roots were not developed. In order to get the roots as deep as possible into the ground,

the trenching must be deep. A good depth is three feet. But if the subsoil is hard and stiff, the trenching must be still deeper. The practice in Europe is to loosen a stiff subsoil, by putting some shots of dynamite into it, which cause cracks and fissures through which air and moisture can penetrate into the subsoil.

By trenching a piece of ground the surface soil, which is rich in vegetable matter, is transferred to the lower strata, and promotes the first growth of the cuttings, and also causes a more rapid decomposition of the insoluble inorganic constituents of the subsoil.

The time, when the ground is to be trenched, is also of some consequence. A porous soil not only absorbs every drop of rain, but also transmits it into the lower strata; into badly trenched soil the rain does not penetrate much, and the water accumulates on the surface. But here, in South Africa, we ought to turn every drop of rain to use. For the young plant it is essential to be well provided with water the first year. This will be the case if the trenching of the new plantation is carried out before the rainy season. It is evident that this cannot be done with all kinds of soils, but it must be done with sandy soils. In the time which follows the pressing season, when the days are still long enough, the preparation of the soil for new plantations, or for replanting old vineyards, should be carried out, instead of spending this time at the seaside. On a wine-farm there is work at every time of the year. It is of great advantage to let the trenched ground rest some time before it is planted. The loosened soil settles by its own weight, and is not tramped hard by the workmen who plant the cuttings. It is also better for the cuttings to be planted in a settled soil, which is no more in motion, because the tender roots are then not broken off by the motion of the ground. An experienced wine-farmer will confirm this, because he must have observed that, not so many cuttings die in a well-settled ground, as in a vineyard where the cuttings were planted immediately after trenching.

The question with regard to the kind of vine which is to be planted is of the utmost importance; and in settling it all local and climatic conditions must be carefully taken into account. Some varieties grow better in light, others in stiff soils, some require a rich and deep soil, whilst others do well on hills and slopes. It is worth while to be particular on this point, because although all varieties do grow on almost any soil, only one or two are well adapted to the place, soil and climate which have been chosen for this new

plantation. Early vines should *not* be planted in warm situations, whilst late grapes should be planted in warm situations. In case two or more varieties would do well on the plantation, the question arises,—which is the better paying vine? As in warm climates the demand for dark wines is greater, it is desirable to plant more dark vines.

The cutting of the sticks for planting has to be done with care. Strong sticks will certainly grow, but it will take a long time before they bear. It is better to select sticks which were bearers. The sticks must be at once removed to a place, where they are not exposed to the drying effects of wind and sun. Here they are cut to the proper length. The usual length is from eighteen inches to two feet. If the soil be well trenched it is better to have long sticks, in order to get the system of roots as deep as possible into the soil. The lower part of the stick must be cut, so that the cut is just below an eye, and oblique to the axis of the stick; the surface of the cut must be opposite to the eye. This is necessary, because near the eye is an accumulation of compounds which are in reserve for the development of the eye; these reserve compounds cause a powerful and rapid formation of roots. The upper cut of a cutting must be just above an eye. Both cuts must be smooth; the wood and bark must not be torn. In planting the cutting thus prepared, the upper eye must not look out too much. It ought to be just upon the surface of the ground. The ground round the eye must be kept loose, especially after rain.

In planting the vines, the distance between the sticks should be carefully considered. The distance depends upon the variety of the vine, fertility of soil and site. In rich soil the distance should be five feet square; in dry situations, 4 feet square is sufficient; in poor soils it might even be less.

The treatment of the young plantation must be careful. The object must now be to promote the growth of the vine in length. The foliage should be developed as much as possible; and it is necessary to remember the following few facts. The tendency of the vine is, to grow in a vertical direction, but it is one of those plants whose stem requires support. Let us therefore give the vine such support, and let us even fasten the young stem to this support, in order to get strong roots and vigorous growth. This treatment should be the same everywhere, irrespective of the system of training the vine in its later years. No doubt the most simple and cheapest method of training the vine is to top the young shoots, and *not* to give any support. The only

advantage this method can afford is that, the shoots branch off, and thus yield a little more shade.

It will now become necessary to review the many different methods of training vines, and to select the most suitable, at the same time taking the question of expense into consideration. To have wooden supports would be too expensive, whereas vine frames are durable, and do not require many repairs; perhaps cane or bamboo may be found applicable.

To adopt a method different from the present could only be advocated, when the produce of the vineyards will have found a good market in Europe.

The digging forms an essential part of the regular work in a vineyard. This must not be neglected, because the looser the ground the more free is the access of the air, and the better the growth. The vineyard must always be kept clean. The picking of the suckers requires some knowledge, and must be done with discretion. The workman must be able to distinguish those shoots which are to remain from those which must be removed. If necessary, the shoots also which bear the first year must be removed, because the object is in the first year the vigorous growth of the vine and not the fruit.

In a vineyard which is in good order, the grapes ripen at the same time; but when the vines are irregularly trained, the grapes may ripen at different times; and in such a case it is necessary to go more than once through the vineyard, in order to gather the ripe grapes. It is utterly wrong to wait, in such a vineyard, until the last grape is ripe, because then some are completely dried up, and this will not only reduce the quantity, but also impair the quality. Dried grapes never contain those delicate volatile aromatic compounds which occur in the ripe grape, and besides do not possess the proper ratio between sugar and acid.

The ripening of the dark and white grapes is different, whenever dry wines are to be made. Light grapes may remain a little longer, but dark grapes lose in value, inasmuch as the colour of the wine gets brownish, and the bouquet compounds get less. The latter is also the case with the light grapes, if they are left too long.

If sweet wines are to be made, the grapes may be left until they are like raisins; or they may even be put in the sun first before pressing, in order to become raisins. The production of sweet wines will never be considerable, as the demand is not great. Even the South African wine consumer will gradually give up the drinking of the half sweet,

alcoholic, partly fermented, unwholesome wines, when the standard of his taste has been raised and educated, by the gradual introduction of wines made by better methods. The present standard of taste of the Cape wines, is the Cape smoke; and the more the taste of a wine differs from this liquid, the lower the wine ranks in the estimation of the average South African wine consumer.

The pressed juice of the ripe grape soon undergoes certain changes, by which its character and composition is completely altered. The several parts of the grape exhibit marked differences in their external appearance: in the stalks we find the woody fibre, in the skin of the berry a very dense cellular tissue; even the fleshy part of the berry, and the seed itself, is very different from the juice. It is evident that these different parts of the grape have also a different chemical composition. By comparing the latter with each other, we find in the hard parts of the grape those compounds accumulated which are not suitable for the constitution of the wine consumer. Only in the juice of the berry occur those compounds, which are useful and which act beneficially and in a refreshing manner upon the human frame.

In making wine, therefore, the sole object must be—to obtain the juice of the grape only. If this juice is mixed with the sap of the stalks and seeds, a liquid is obtained which cannot be called wine, not only on account of the foreign compounds, but also on account of its injurious action upon the system.

Such wine as is injurious will certainly not be much in demand, at any rate not in countries in which the public is used to drink wine made on correct principles. If badly prepared wine is worthless, how much more objectionable must be a wine containing injurious foreign ingredients? By adding foreign substances to a wine it is not improved.

The addition of spirits, although made from wine, is unnecessary, because the natural strength of our wines is sufficient to render them fit for transport, provided the wine is ready, and does not require any further manipulation. It does not matter whether the wine is to cross the line or not, because the change of temperature and the motion of the vessel will never affect a sound wine. That spirits must be added, in order that the wine may cross the line, is a phrase thrown as dust by ignorants and others into the eyes of those who have no knowledge of the secrets of doctoring and concocting Cape wines. Of course, if the object is to send a large quantity of unmatured wine, which has the

germs of disease, of acetous and mucous or other fermentation in it, across the line, spirits of wine comes in very handy, and is, after all, preferable to salicylic acid, and other forbidden remedies. Also wines which have not gone through all the necessary alcoholic fermentations, will again ferment when filled into small casks, and again temporarily exposed to higher temperatures.

The reason for the general belief that it is necessary to add spirits to wine, which is to be sent to Europe, may be found in the fact that unmatured wines were sent away and got spoiled, whereas those that were mixed with a great quantity of spirits stood the voyage well. There was a time when the price of wine was high, almost double the cost of production; wine-farming was then a gold mine; every year the produce was soon sold off; no care or trouble was required for preparing the wines, and a less careful way of making wine became more general. To keep these bad wines spirits were added, which, it is true, effectually destroys the germs of further fermentation. The Cape wine gradually lost its reputation, and the export of wine has come down to what it is now. Two hundred and thirty (230) leaguers only were exported from this wine-producing country, during the first six months of this year 1885. There is no doubt that this country could, every year, export 100,000 leaguers of wine. Let us hope that we may see the day when it will do so.

Another effect of making inferior wines is the spread of consumption of other spirituous liquids. The longer we wait for making an effort for the improvement of the wine-industry, the more difficult will be the competition against the beer and the brandy. At present good, sound wine could still be produced, as cheap as ordinary beer, and a better class of wine could still compete with the imported beer. If good wine is generally made, it will soon overcome the competition of the brandy, whisky and water, &c.

Three points must be carefully attended to in making wine, viz.: Cleanliness, good fermentation, and the keeping away of all germs which will affect the wine. Of these three conditions, cleanliness is most frequently neglected. It is quite impossible to make good wine, which of course must be sound, if a large number of destructive organisms are carried into it during the pressing, or from the cask itself. The want of cleanliness is not only apparent at the pressing, but also extends to the casks; the latter may often be considered as places where the germs of all diseases are accumulated. What idea must the man have of the nature

of fermentation, who cleans his casks, with grape juice or wine? The inner walls of the casks, coated with layers of these germs, are nourished with the very liquid which gives strength and life to those germs, which are in, so to say, a dormant state. The brush and plenty of water are the means of cleaning the casks, and not wine or grape juice. With a certain degree of pride we have been told by some wine farmers, that they have casks which never require cleaning, but are always again filled up with young wine. Now, all this is based upon ignorance and superstition. The casks *must* be cleaned, and this is best done with the brush and water. The casks must be left open until all the water is taken out again, and the inner walls of the casks are quite dry: there are then no germs in the casks, no dirt, no moisture, simply nothing by which those destructive organisms could keep themselves alive. The casks not in use, must be submitted every six months to a thorough cleaning.

The colonial casks are not well made, and have the fault in all—that tap, and bung-hole, are not round. This is either due to bad tools or to careless workmanship. The holes cannot easily be made air-tight, and a small piece of canvas or linen must always be used to close the bung-hole. By capillary attraction a little wine will go up into those pieces of linen which are out of the cask, there the wine changes into vinegar, and the natural enemy of the wine in the cask is thus on the very top of the cask. Those pieces of canvas on the bung are regular breeding places for the germs of the acetous fermentation, which drop on the first occasion into the cask.

The first rule in the manipulation of wine is, to keep casks and wine store scrupulously clean. All skins, meat, dry or green vegetables and fruit, &c., which can serve as food for the propagation and nutrition of the germs of putrefaction and fermentation, must be kept out of a wine store. When the effects of these germs manifest themselves in the wine, it is too late to do anything. A wine which has got the germs of acetous fermentation in it is not to be saved, whatever the wine-doctors and wine-prophets may say. The germs of acetous fermentation may be destroyed by adding much and strong spirit; the acetic acid may be neutralized by lime, soda, potash, &c.; but then the acetate of lime, soda and potash remains in the wine, and will exert an injurious action upon the constitution, as well as the acetic acid itself. But now, what is the liquid with all the spirits, and lime and soda and potash, in it?

The name "Cape Wine" should have some legal pro-

tection, and it should be a punishable offence if such concoctions are sold under the name of "Cape Wine." It is true, alcohol has not a destructive action upon the wine itself: it renders the same more durable, but not better; because it is added in too large quantities. There are no laws yet in the colony against the adulteration of wine, and there is much scope for adulterating wines. But if the Cape wines are sent to Europe, they are examined, and I can assure you the wine-journals, which watch the interests of the consumer there, are only too glad to get any unfavourable account spread. It would be interesting to collect the reports on Cape wines, published at the time when the reputation of the Cape wine was on the decline. I have no doubt these reports contain a warning and a lesson.

Although the taste of the Colonial consumer is not of the best standard, we must remember that it has been developed by what was sold to the consumer. The wine farmers and wine merchants have the power in their own hands, to gradually change the taste of the public; and unless they are all in earnest on this point, and combine for this purpose, by making the wine in the proper way, and manipulating it on sound and clean principles, I do not see much hope for the wine industry at the Cape. Why must the taste of the Colonial consumer be different from that of the European? It would be easy to reform the taste of the Colonial consumer, but this would require some self-sacrifice, patriotism and consistency—rare qualities!

Besides cleanliness, good and close fermentation is the second important condition in making wine. In making light wine, the juice of the grape, free from husks, stalks, seeds, and fleshy parts of the berries, must be fermented in vessels closed in such a way that only filtered air has access to the fermenting liquid. Dark wines must also undergo close fermentation with the skins; in this case, also, the stalks must be removed.

Open fermentation is adopted in the old method of making wine. I will now try to show that this open fermentation is objectionable, and that by means of it a produce is obtained which may be called an alcoholic liquid, but not wine.

The open fermentation takes place in large fermenting tubs without covers. They cannot be kept clean, and are not kept clean. As these tubs are open, all impurities, germs of disease, &c., have free access, and flourish beautifully in the dust and dirt. In the pressing, there is a higher temperature in the wine-store, because all the doors, &c., are left wide

open. As the workmen move about much juice falls on the ground, and is excellent food for the germs lying there; they develope fast, the spores fly about, and drop into the open fermenting tub. If the amount of sugar in our grapes were not so high, and consequently the amount of alcohol less, no wine at all could be obtained by this method, it would at once be changed into vinegar. During the fermentation of the grape-juice everything must be kept away which might endanger the quality of the produce. If, at this stage already, the wine gets diseased, and is put into dirty casks, it will be spoiled in a few months, and is worthless. And if well-fermented wine is put into bad casks it must also turn sour. The next drawback of the open fermentation, consists in the loss of the volatile ethereal bouquet compounds of the juice. The temperature in the store is very high; the temperature is raised by the heat of the grapes gathered during the day; they have been more or less exposed to the sun.

During fermentation the temperature of the fermenting liquid increases much, so that the delicate ethereal bouquet compounds are simply volatilized by the heat. This is a great loss, and does not occur in the close fermentation, because here they condense on the upper part of the inner walls of the cask, and are re-absorbed by the fermented liquid. Let any wine farmer try this experiment, and, after twelve months, compare the wine which has been made on this principle, with wine made with open fermentation of the same grape, from the same vineyard. It is also the custom in the open fermentation of the white wine, to put husks and stalks into the fermenting tubs. As long as much alcohol is not formed from the sugar it is of little consequence. But as soon as the alcohol is formed, it will extract strong smelling substances from husks and stalks, and also a very considerable amount of tannine. These substances may give to the young wine a fuller taste, which is rather liked in South Africa, but renders the wine inexportable. Such wine we cannot export.

The only correct way of carrying out the fermentation of light wines, is as follows:—The *ripe* grapes—not the raisin-like grapes, unless sweet wine is to be made—are properly cut and collected; in order to get only ripe grapes, the vineyard should be gone through at least twice. Good wine, of an harmonious taste, can only be obtained from uniformly ripe grapes. The pressing of the grapes requires much attention.

Before pressing commences, all tubs, casks, baskets, floor

and walls must be cleaned. The old method of tramping is untidy, and many substances get into the wine, which are not removed by fermentation. It is best done by grape mills, of the most approved construction, and grape presses of the modern systems. Both together work quickly and excellently, and the greatest cleanliness can be maintained. The construction of the grape mills must be such, as only to press, not to tear, the berry, and not to break or smash the stalks or the seeds. The grape mill and press must of course be cleaned from time to time, that the juice adhering to it does not ferment. The grapes brought in from the vineyard are put at once on the mills. The mash is put into the press, by which as much juice as possible is pressed out of the husks. In making choice bouquet wines, the stalks are removed from the mash before it is put into the press, in order to prevent any sap from the stalks getting into the juice. However small the amount of this extract from the stalks may be, it will certainly impart the bouquet of the wine. The stalks are best removed by passing the mash through a sieve with wide meshes, which allow the husks and berries to pass through, but the stalks not. These sieves are made of tinned iron wire of considerable strength, and must of course be also cleaned from time to time.

The first run from the press is the best, because by the first gentle pressure, only those cells of the grapes are broken, which contain the best juice; by stronger pressure, also good juice comes off, and the strongest pressure yields the last traces of juice. From one press juice of three qualities may be obtained, which may be put into separate casks, and developed into wines of three qualities. But this separation of the juice is not necessary. The juice which runs off from the press must pass through a fine sieve to retain seeds or isolated husks, which passed through the press. In this way only a perfectly good liquid is obtained, which consists of nothing else but the juice of the berry. The juice is now put into the cask, where it is to ferment. Any good, sound and clean cask can be used for this purpose, but must only be three quarters full, in order to prevent the running over of the fermenting liquid. The carbonic acid gas which is formed during fermentation is to escape through the bung-hole, but in order to prevent dust or other germs from entering the cask, it is necessary to close the bung-hole by such means as will purify the air which enters the casks, and will at the same time allow the carbonic acid gas to escape. The most convenient way of closing the bung-hole, is to use a fermentation bung, of which there

are different constructions; but also a small linen bag, filled with clean sand, will do, if simply placed upon the bung-hole. As the grapes, when they are pressed, have generally a high temperature, it is necessary to have the fermentation store as cool as possible.

On a wine farm the store is generally used for old or young wine, for the purposes of fermentation; and this is really of very little consequence for the old wines, and the low temperature of the wine store is favourable for fermentation. A cool store is therefore the most suitable place where the fermentation of the grape juice can go on. But, in order to have a cool wine store, it is necessary to attend to a few points in building the same.

The place where a store is built has a great influence upon its temperature; a place under trees, and exposed to the wind, is the best. It is desirable to have the walls as thick as possible, and made of bad heat conductors; or if the means allow it, to have double walls, which will reduce the changes of temperature within as much as it can be done. The principal object is to have a store in which, all the year through, the temperature is almost equal. This is very important for the development of the young wines, which mature much sooner in such stores, than in others, where the temperature changes much in the course of the year, and even in the course of the day. The best way of keeping the store cool for fermentation, is to have a system of ventilation by which cool air is carried into the wine store, and the warm air allowed to escape. Wherever a new wine store is to be built, the wine farmer ought to make a point of having a separate space as fermentation store; the pressed juice can easily be carried by pipes into the fermenting vessels.

In the fermentation of dark wines very similar mistakes are made as in the case of light wines; cleanliness is as much neglected as in the case of light wines, and therefore it is generally supposed that dark wines will not keep without spirits. If dark wines were prepared with the same care that is prescribed for the preparation of white wines, a wine would be obtained, which could be sent to all parts of the world.

The making of the dark wines is different from that of the light wines. The juice of the dark wines must ferment on the husks in order to absorb a larger amount of tannine and to get colour. The process is this: The cutting of the grapes must take place just before the grapes are completely ripe, in order to obtain the proper red wine bouquet. If the grapes remain too long, the colour in the husks is altered, getting brown; the bouquet is also disadvantageously

changed, becoming similar to that of wine made from dry grapes, and we do not get the dark wine which is appreciated and valued all over the world. Very frequently it happens, especially in the case of pontac, that the grapes are too sweet to produce a dry dark wine. The production of sweet dark wine, or rather red sweet wine, has no future, so far as export is concerned. The preparation of such wine requires a much longer time than is necessary for dry wines. We will therefore return to the subject.

The cut grapes are first put in the grape mill, the mash is then put on the sieve, where the stalks are separated, and this mash is now put into the fermenting tubs for dark wines, which must be of a peculiar construction. It is evident that, the husks will float on the surface, whilst the fermentation is going on. This would damage the wine, because the husks are more liable to turn acid than the liquid, and the colouring matter is not extracted from the husks. In order to prevent the formation of acid in the husks, they must be kept immersed in the fermenting liquid.

In a fermenting tub for dark wines, a second sieve-like bottom is put, of which the holes are so small that no husks can pass through. This second bottom must be pressed down until it has immersed all the husks, and is completely covered by the liquid juice. In this position it is kept by suitable bolts made of wood. The fermenting tub is, of course, only three-fourths filled with the mash, and is closed with a cover provided with a bung-hole also covered with a small sand bag. If the grape contains much colouring matter in the husks, and perhaps also in the juice, the fermenting liquid should not remain too long on the husks.

In order to determine the exact time when the "must" should be drawn off, it must be examined every day as to colour, and by tasting, it can easily be ascertained what the amount of tannine is, which must not get too high, as the excess of tannine has afterwards to be removed again by fining; and this is a great drawback for wines of a superior quality, as each fining carries off a considerable quantity of the bouquet compounds. Generally six to eight days will be sufficient, but grapes which have too little colour may remain from ten to fourteen days on the husks. It requires some attention to ascertain the proper time when the "must" is to be drawn off. Dark wine, which is too light, loses in value, as well as when it is too dark and raw. If the time has come to draw off the wine, it is transferred into a sound and clean cask, the husks are kept back, put into the press, and yield a wine of inferior quality. If the mash is still

fermenting when the drawing off takes place, it does not matter, because the fermentation can now go on in the cask, and the quality of the wine is the first point to be attended to. As soon as the fermentation of light wines as well as dark wines is over, the wines must be drawn off from the yeast which settles down, and filled into casks, which must be kept full to the bung-hole. Only a clean and sound cask must be taken, and this must be always kept full. Casks which are half full, or diseased, will only spoil the wine.

This method of making wine is a very simple one, and by means of this method it is quite impossible to make bad wine. If a wine turns bad it is only due to carelessness, and whoever has acid wine ought to be silent, and blame himself and not the method. The making of wine is based upon very simple laws of nature, which always lead to correct and useful results.

I have endeavoured to give you a brief account of all the operations with which a wine farmer must be acquainted in order to make wine. The manipulation of the wine, that is to say, the treatment of the young wine, until it is ready, and matured, is not the business of the wine farmer at all. *This* is the work of the wine merchant, who ought to purchase the young wine from the wine farmer as soon as possible after it is made.

I know perfectly well that most wine merchants have their own ways of manipulating and preparing wine; but, notwithstanding this, I shall on some other occasion, give an outline of the manipulation of wine, based upon correct principles. And if this method be adopted by the wine merchants, there is no doubt that only good wine will be produced, only such wine as will regain that reputation which has been lost by carelessness. I have no doubt, that the wine industry of the Cape can be developed again to such an extent as to become an inexhaustible source of wealth to the whole country.

X.

WATER-FINDING, DAM-MAKING, RIVER UTILIZATION, IRRIGATION.

By Thomas Bain, C.E., *Public Works Department.*

In connection with my engineering duties, which extend over a considerable portion of the colony, I have had opportunities of making myself well acquainted with such geological formations as are most intimately associated with the production of springs and water generally.

In my frequent journeys through the Great Karoo—where water is the element so much needed—I seldom lost an opportunity, when I noticed any good places where springs might be found by excavation, or where the water supply of existing springs might be augmented, to point them out to the proprietors of such places, and give them whatever advice I could on the subject. In this way my hints were acted upon, and in many instances successfully carried out. Many of my country acquaintances then begged of me to make my views public in a tangible and practical form, which I endeavoured to do, by the publication of a small pamphlet in the English and Dutch languages, on water-finding in connection with geology, and on the construction of dams and wells, &c., but as there was only a limited number of copies issued, it is just possible that many of the gentlemen present never saw or heard of it. I shall therefore recapitulate portions of it.

The Karoo is divided into two great geological formations of aqueous origin, and two smaller ones of igneous origin.

The Upper Karoo extends from the Orange River to about 12 or 15 miles south of the Nieuwveld, Camdeboo, Tantjesberg and Kroomie Ranges. This formation is composed of a blueish shale—called "Blaauw Gruis Klip" by the farmers—lying in almost perfectly horizontal beds. The rocks composing this formation are aqueous, as their regularity of deposit clearly indicates. Through these beds protrude dykes of greenstone, well known to the farmers as "Yzer Klip Kopjes." These are igneous rocks, which were upheaved in a molten state subsequent to the formation and deposition of the blue shale beds.

They run in all directions, throw off spurs or branches, and frequently assume ridges somewhat of the horse-shoe shape, with an occasional outlet or "poortje" in them. Their un-stratified character, combined with the fact that they are always coated with thin layers of calcareous tufa or white limestone, renders them impervious to water, except at the outlet or "poortjes," where they sometimes have deep-seated cracks, causing leakage. This I shall refer to hereafter.

The depth or source of these dykes is interminable. It will be obvious, therefore, from their peculiar formation that they are nothing less than vast underground reservoirs, arranged by Nature for the production of springs and storage of water; and that the water thus stored is effectually protected against evaporation from the sun's powerful rays. But for this wi-e provision of Nature the Karoo would be a desert, where neither man nor beast could exist.

SPRINGS.

People who have travelled over the Upper Karoo beds must have observed that wherever there is a break or poortje in a greenstone ridge, there is sure to be a spring immediately above it. If any reflection is bestowed on the description just given of the underground water storage, it will be easy to account for the occurrence of springs in those positions. But to make it more comprehensible I have endeavoured by Sketch to show how innumerable little veins of water permeate the shale beds, until they are arrested by the dyke, then their course is suddenly diverted, and they run along the wall of the dyke till they reach the break, where they are met by a similar arrangement from an opposite direction; and, in a united volume, they are forced to the surface, forming a strong spring or a weak one, according to the drainage area above the dyke. [Refer to Sketch for particulars.] The shale beds are generally porous for 15 or 20 feet in depth, and then they become very compact. The springs at Beaufort West, in two breaks of a huge dyke; at Victoria West, at Aberdeen, and at Hanover are fine illustrations of the above theory. I could enumerate many others at farms, but for reference I think the above will suffice.

Indiscriminate digging for water is much to be deprecated. By endeavouring to augment the water supply of springs, the farmers invariably open a deep trench in the shale bed below the gap of a dyke instead of above it [See line *A B*

on Sketch]; and when they arrive at the bar of greenstone in the gap, which is terribly hard rock to blast, they generally abandon it, after having expended considerable sums of money to no advantage. Where some have had the means to cut through the bar, their success has seldom been commensurate with the cost of the undertaking. The low level to which the spring is reduced by the operation frequently causes a loss of irrigable ground.

If the drainage area of a few well-developed springs of good dykes, such as those of Beaufort West and Victoria West, together with the quantity of water produced by them in a given time, be ascertained, any farmer of ordinary intelligence might find out, by a simple rule-of-three sum, how he stands as to his water supply, before he goes to the expense of excavating. But as farmers have not always got land surveyors at hand for such a work, the drainage area of a spring might be found by themselves, near enough for all practical purposes, by simply walking round it and timing it.

Thus, if the Victoria spring has a drainage area of ten hours' walk, and produces 100 gallons of water in ten minutes, and your spring has an area of five hours, it ought then to yield fifty gallons in the same time. If it falls short of the mark, you have some evidence of leakage under the bar of your dyke, and it would then be advisable to trace it by trenching on the junction line of the shale and greenstone above the dyke. [See line *C D* on Sketch.] (This theory is based on the assumption of the rainfall of the Karoo being tolerably uniform. It varies much, sometimes, in a season, between one division and the other; but taking the average for several years, it is sufficiently uniform for the above purpose.)

When the crack is found and properly closed, there will, in all probability, be sufficient gravitation to force the water over the bar of the dyke or ordinary spring level.

Dykes do not always assume so favourable a shape as the horse-shoe. [On Sketch.] Sometimes they are only fed from one side, cutting the shale beds diagonally [See *A* on Sketch]; and it often happens that a superabundant quantity of the calcareous tufa or white limestone is accumulated just above the gap of the dyke, which, naturally, would divert the course of the water into another channel, however good the break of the dyke might appear. In such cases a diagonal trench [shown by the line *E F* on Sketch] should be cut, and as much of the limestone removed as possible, to develope the

spring, which is sure to be discovered if there is anything like a good drainage area above it.

I have noticed numbers of such instances, especially in the Victoria West, Carnarvon and Hanover Divisions, where good springs might be developed at a trifling expense, but where nothing has been attempted by the proprietors, presumably for want of advice.

There are many splendid dykes with good breaks in them, generally at the foot of the mountain ranges, with just sufficient drainage area to produce feeble springs; yet you find people spending hundreds of pounds at such places, trying, as it were, to draw water from a stone, which, I need hardly say, ends in utter failure.

Field lectures to the farmers in reference to such matters—taking a dyke of that description as a text—would undoubtedly be productive of much good.

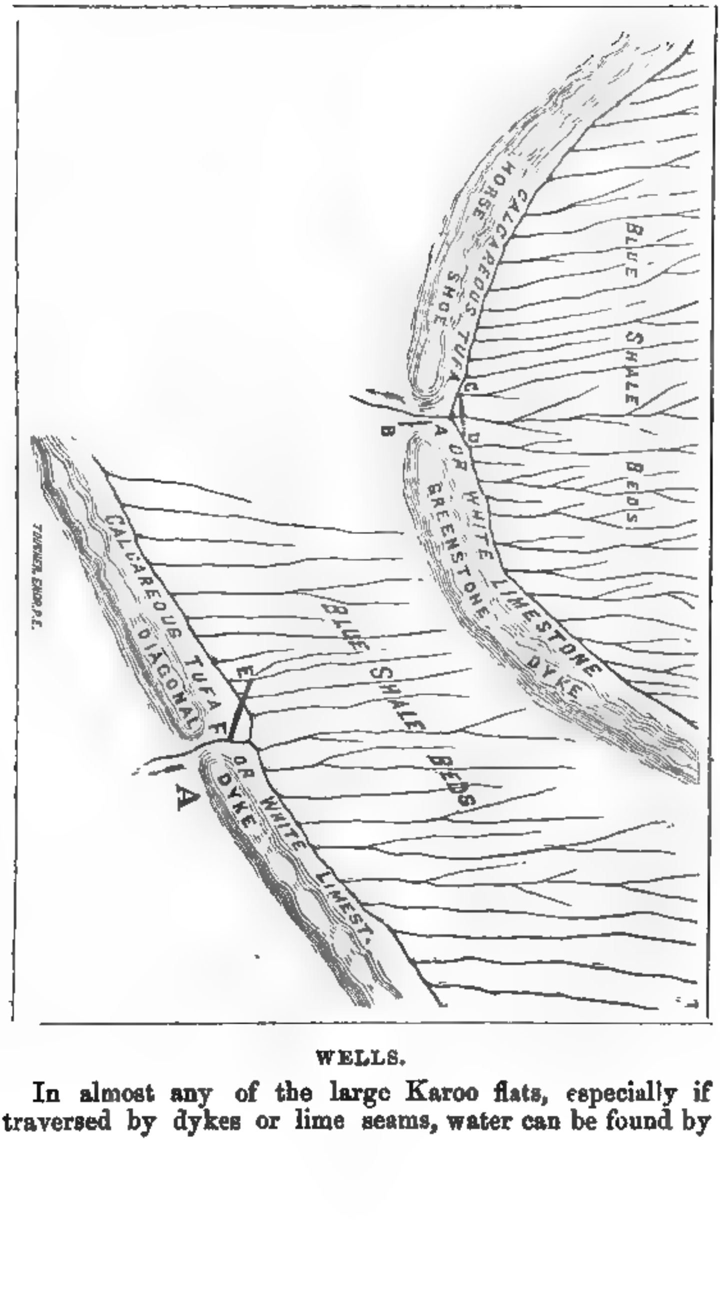
Before concluding this subject, I would like to mention a remarkable instance of an unbroken dyke, which forms an underground reservoir, the drainage area of which is so level, that it has not gravitation sufficient to force the water over the wall of it; and when the feeding veins are overcharged, after heavy rains, it overflows by means of some back or lateral outlet not visible on the surface. This dyke runs across a valley immediately below the village of Calvinia, which stands on an underground reservoir. Hence it is, that by sinking wells, water can be found at a depth of eight or ten feet in any part of the village. Fortunately, the dyke is on the Commonage, otherwise the proprietor of the farm adjoining, might easily tap or drain the entire village, by cross cutting the dyke. I have met with more cases of this sort; but they are by no means common; and such are the places where well-sinking must prove successful.

Besides the greenstone dykes already described, there are limestone seams traversing the shale beds of the Upper Karoo, in various directions, between the dykes.

These seams seal up the fissures of the shale beds so hermetically that springs are produced by their interposition, in the same way as with the dykes. A fine example of this character is the spring at Fraserburg, which supplies the village with water. The much-talked-of "water aar" of the farmers, is nothing but a limestone seam, by which water is traced, from the fact that, vegetation is rendered conspicuous in its growth, owing to the moisture underneath.

The surest indicators of the farmers' water vein (aar) are the "Wolve or Krie-doorn" and the "Karee-boom." There are, however, many lime seams, where the water lies too

deep to affect vegetation, unknown to the farmers, where latent treasures are still in store for them. When a limestone break or a seam has to be opened to augment the supply of water, it might be cross-cut in the reverse way to that suggested for the bar of the greenstone dyke; because it is not so difficult or expensive to work.



WELLS.

In almost any of the large Karoo flats, especially if traversed by dykes or lime seams, water can be found by

sinking wells; but in most cases when found, the farmers are disappointed, because it does not rise to the surface; and for that reason well-sinking is not much resorted to. Ordinary reflection ought to show that, where rocks are horizontally deposited, there is an insufficiency of gravitation to force the water to the surface, which must be overcome by some pumping apparatus.

In confirmation of my assertions, it will be observed that wherever springs occur in the periodical rivers of the Upper Karoo, such as the Salt, Kariega, Zak, Zeekoe, Fish, Brak and Sundays Rivers, &c., &c., &c., they will be found immediately above the crossing of a greenstone dyke or a limestone seam.

LOWER KAROO BEDS.

These beds have a wave-like dip, forming troughs in some places, but are devoid of igneous or intrusive rocks, except near the Great Zwartberg Range, where the trap conglomerate (an intrusive rock) occurs, which runs in parallel belts to the range, and is consequently of little use for water-finding. In fact, in the way it occurs, it is rather detrimental to the water supply of the Karoo, as it intercepts the drainage of the Zwartberg Mountain, and diverts it from the Karoo.

Limestone seams are scarce in these beds. Where an occasional one traverses a trough valley, a good spring is sure to be found.

For well-sinking, if advantage is taken of a valley, where a trough is formed by the dip of the rocks, water is sure to be found. Approaching the southern boundary of these beds, as their dip becomes higher and higher, the chances of water-finding diminish in proportion as they increase in dip, owing to the fact that, the drainage finds its way into the almost vertical fissures of the rocks, and never comes to the surface again.

CONSTRUCTION OF DAMS.

Owing to the severe droughts in the Karoo for several consecutive years, much has been done of late in the way of dam-making; but in most cases, apparently for want of advice, costly structures have been misplaced, and erected on such unsound principles that numbers of them are swept away after heavy thunderstorms, which, to say the least of it, must be disheartening to the proprietors.

Like to like is the first principle to be observed, *i.e.*, if you have a site with a clay bottom for a foundation, make your embankment of earth and clay; but when you have a stony foundation, make your dam of good masonry.

Too much importance cannot be attached to the choice of sites. Endeavour always to throw the thrust or force of the stream against a natural object, which, for obvious reasons, is better able to resist it than an artificial one.

The natural tendency of water is to run straight until it is obstructed, when it re-acts with loss of its velocity until it is concentrated in a straight course again. In this way the sudden bends and kinks in valleys and rivers were caused in their original formation; and they might be turned to good account if chosen as sites for dams; provided always that, their capabilities for holding water are also suitable.

Let us now consider a good site for a dam in the bed of a valley. The direction of the embankment should be as nearly parallel to the current as possible, with a good outlet, to give the stream as straight a course as possible. Before, however, fixing on such a site, a careful inspection should be made of the nature of the ground where the outlet is to be. From the fact of the bend in the valley having originally been caused by some natural obstacle, that obstacle may be rock so difficult to work that, the site may have to be abandoned on the score of economy; but if it be only shale or ordinary rock, it will be all the better for an outlet. The material excavated could be advantageously worked into the embankment or wall of the dam. A second outlet will be found useful for the back water, but is not absolutely necessary.

I look upon a site thus chosen as preferable to any other for damming up a valley or river. The advantage gained by it is that, an embankment or wall placed in such a position, is relieved entirely from the thrust or force of the current. It has merely the ordinary pressure of the water to resist, and need therefore not be so massively and expensively constructed as one which has both current and pressure to resist.

In almost every division in the colony there are numbers of such sites in the shale valleys and kloofs, where splendid dams, on the above principle, might be made, at a comparatively small outlay.

When a dam must be constructed near a homestead, without choice of site, across a straight valley, it would be advisable to place the embankment obliquely to the stream, say at an angle of 120 degrees, with one outlet at the lower

end. In such a position it offers so little resistance to the stream that the water glides off easily to the outlet, with scarcely any effect on the embankment.

On this principle, the more obtuse the angle of the embankment is to the stream, the less the resistance would be; but if carried beyond 120 degrees it would add to the length of the embankment, and consequently to the expense of construction. For all practical purposes, the above shape would be most suitable. The half moon or crescent form is the one mostly adopted by the farmers for dams, but unfortunately in the reverse way that it ought to be. They apply it with the concave side to the stream, which, I need hardly say, is the worst and weakest form that could be adopted. By turning the convex side to the stream with an outlet at each end—the old popular plan—a structure could be formed capable of resisting almost any flood. This form of dam is even better adapted for a straight valley than the oblique one before suggested, as it divides the stream and carries off the water by two outlets instead of one.

These plans of dams are arranged on well-established principles, which, if adopted, will be found to be sound, and the most economical in the end.

The plan with full slopes of 3 to 1 inside, and 2 to 1 outside, with a puddled core, is the most desirable one to adopt when a large dam is in contemplation, with a clay or earth foundation. If stone is procurable, the slopes should be pitched with it, especially on the inner face. The object of pitching is not so much for strength as to prevent the embankment from being rippled and caved when the water is set in motion by wind or other causes. The bottom level of the outlet or outlets should be at least five feet from the summit of the embankment, which is the established proportion. If the above precautions are strictly adhered to, a dam, thus constructed, will resist almost any pressure it is likely to be exposed to by our Cape thunder-storms.

For ordinary purposes, in structures not exceeding 12 to 15 feet in height, the inner and outer slopes caused by the natural fall of the ground might be adopted with tolerable safety, provided that there is a puddled core, and that the faces of the dam are pitched with stone.

The next plan to consider is the correct proportion for strength of a stone-built dam.

Excellent lime is procurable, and can be burnt in any part of the Karoo, especially if the blue limestone is used instead of the white. It should be used in the proportions

of one part lime to three of good sharp sand. The sand should be washed to free it from all saline properties. Cement would be better, but it is too expensive.

The building stone of the Karoo is of such excellent quality and shape, that it would be more economical—where suitable sites occur—to build dams of masonry than of earth embankments. A good example of this is to be seen at "Kruid-fontein," the property of Mr. Stegman, in the Willowmore Division. That gentleman blocked up a narrow gorge by means of a stone-built dam, which throws back a fine sheet of water. The wall is 24 feet high, with a base of 5 feet, sloping up to 2½ feet at the summit. It is built of undressed stone laid in lime mortar in the proportion of one of lime to one of sand, with the interstices well grouted.

This structure, though within the prescribed limit of a properly built stone dam, has been standing for some years. It has no outlets, but when full, the water is allowed to flow and spread over the coping of the wall (not a safe practice), but as it falls on a solid rock bottom and the overflow spreads over a large surface, it has hitherto sustained no damage.

Another attempt is being made by Mr. G. Hitje, also of Willowmore, to block up a gap of 70 feet on the same principle; but from what he has informed me, I am afraid that he has started on too narrow a base for such a height of wall. The correct batter for masonry for dams is from 4 to 5 inches to the foot.

The rule for calculating the lateral pressure of water against a vertical embankment or wall is, to take half the length of the embankment and to multiply it by the square of the depth of the water, and then by 62½, which is the weight in lbs. of a cubic foot of water. The result will be the pressure in lbs. When that body of water is set in motion during a flood, the pressure is much increased. For these reasons, it will be seen how necessary it is to adopt the long slopes of 3 to 1 on the inner faces of dams, because they have to resist both pressure and velocity of the stream.

Large shallow dams, which are by no means uncommon in the Karoo, should be avoided if possible, as so much water is lost by evaporation and absorption. When dams are not required for irrigation, it would be advisable to utilize the standing pools in valleys, which are known to the farmers as "kuilen" or "kolke." From the fact of their depth and narrowness they are subject to so little evaporation, that they retain water much longer than shallow dams of larger capacity. By lengthening and deepening these pools, and planting trees on their banks to

prevent evaporation, they will be found the best and most inexpensive for a stock-farmer. If practicable they should never be wider than from 20 to 25 feet. A "kolk" is generally found in a valley where little or no silt comes down, and is therefore an excellent criterion in the choice of a site for a dam.

The rapidity with which embankments of dams are raised in construction is a fatal error. They should be made gradually, in two or three sections, to allow time for the proper consolidation of the earthwork. Dry earthwork in embankments settles and shrinks at the rate of 10 per cent., but when exposed to water, as in the case of a dam, it shrinks from 14 to 15 per cent.

Supposing a dam has to be constructed which is 25 feet in height; it would be necessary, first, to have the ground dug up as far as the foundation extends, 12 or 18 inches in depth, to give proper bond to the earthwork. (This precaution is seldom adopted by the farmers, although it is so essentially necessary, to prevent leakage.) Then the first section should be carried up about three feet in height, with the proper slopes, viz., 3 to 1 on the inner and 2 to 1 on the outer faces. A temporary outlet for the overflow of the water might be made, and the work abandoned till rains fall. In the meantime it should not be fenced in, as I have noticed over-careful people do, to prevent cattle from trampling down the earthwork. The more this can be done, the better it will be for consolidation.

When there is water in it, the work should be resumed, and a longitudinal trench made in the middle for the puddling, sinking it well below the foundation line. Water and clay should then be poured into the trench, and be well pugged and trodden down, in layers of about a foot at a time, till the puddling is flush with the top. Then the surface crust of the embankment should be slightly dug up to give bond to the new work, and another section of the earthwork should be added to the embankment, repeating the puddling process until it is 20 feet high, which is the proportion of puddle work to a dam of the above dimensions. After that, the embankment can be brought to its full height, viz., 25 feet.

When this is done, the outlet should be made of sufficient capacity to allow the overflow of water to escape freely.

Great care should be taken to round off the corners of the outlets well, so as to prevent injury by the scour of the water. Good rubble walls of heavy stone would be essential at the corners.

When two or more dams are to be made simultaneously at a farm—as is frequently the case—the above process of construction will, probably, be found an advantageous one.

No dam should be made without a silting dam a little above the intake; and the silt should be removed after heavy floods. The simplest method is to have it made of bushes, laid in the stream, with the ends upwards, and covered with stones and ground. It is surprising what an amount of silt can be arrested by such a simple process, and what an advantage the owner of the dam will derive from it. A rubble wall will also stop silt, and might be adopted where bushes are scarce.

The large dam at Beaufort West, for want of this precaution, will, before long, be silted to the level of the overflow, and become useless, unless steps are taken to prevent it.

In places where farmers drink out of the same dam with cattle, sheep and pigs—not at all uncommon in the Zwartland and Swellendam Ruggens—although a most unwholesome practice—a simple contrivance, in the shape of a large filter, could be arranged, by sinking a half-leaguer cask at a convenient spot in the dam, to about two-thirds of its depth, or by building a sort of funnel or chimney in it. The cask should be perforated for six or eight inches round the sides, and bedded with alternate layers of gravel, charcoal and fine sand, extending about fifteen or eighteen inches above the perforated line, and a lid should be kept on it. If the chimney plan is adopted, it should be built of rubble masonry for about eighteen inches from the foundation, to allow the water to percolate, and then of good brick or stone and lime, and it should be bedded as above described. Pure and wholesome water would thus be procured at any place, and, no doubt, a considerable reduction in the doctor's bill would be effected. When dams are made of earthwork and the water is required for irrigation, syphons are undoubtedly the best means of drawing the water from them; but in masonry dams, iron pipes built in the wall at suitable levels would be the most convenient.

The average rainfall of the Karoo has barely exceeded two inches, during the last five years, but previous to the droughts it averaged more than double that quantity.

DIVERSION OF RIVERS, ETC.

I have said so much already about Springs and Dams that I am afraid I shall exhaust your patience before I arrive at what I consider of greater importance to the

general interests of the colony—*i.e.*, the Diversion of our Rivers and Mountain Streams for Irrigation. Not being intimately acquainted with the Eastern Province, I shall confine my observations mostly to the Western Province, where I can speak definitely of several important irrigation schemes that might be advantageously carried out, though I have no doubt that the Eastern rivers afford equally good facilities for such undertakings. Now that there are so many convicts in the colony, and so few public works to employ them upon, I cannot help thinking, that if some large irrigation works were started, it would be the most profitable way of utilizing their labour.

An Italian gentleman, after travelling through the colony some time ago, remarked "that, the Cape was a strange place; its rivers were allowed to run in their natural courses."

In Italy, I believe, they are all diverted for irrigation. I have often thought of that remark, knowing what facilities Nature has given to us, and how little advantage we have taken of them.

It is a well-known fact that, running water is more conducive to the growth of vegetation than standing water; therefore, much as dams and wells are necessary, I am a strong advocate for the diversion of our rivers and mountain streams, for irrigation, before any other system is adopted.

I. First of all, I shall take the Orange River, from any point between the railway crossing, which is 3,509 feet above the sea level, and the village of Prieska. The river, or a portion of it, could be diverted by means of an ordinary aqueduct, the soil being retentive enough to hold water without much loss by absorption, and it could be brought with a good fall on to part of the Crown land, which computes an area of over 5,000 square miles, the half of which extent—at least—could be irrigated. The soil is exceedingly rich, especially near the banks of the river, and in the Karoo valleys, and it is capable of producing the best of cereals, fruits, vegetables, wines and brandy in great abundance, and timber might also be grown there to advantage, wood being very valuable in that locality.

The produce raised there will find a ready and profitable market amongst the natives over the Orange River, by barter for cattle, sheep, &c.

At present this large tract of country is of comparatively little use to the Government. It is occasionally leased to some trek boers, when there happen to be a few showers of rain, but brings in little or no revenue.

To show how feasible the diversion of the Orange River

is, I have been credibly informed that, two farmers who have leased some Crown land below Prieska, are now engaged in making an aqueduct from a place called "Weg-draai," in the river, to irrigate their lands; and they are in a fair way of success; while near "Upington," an enterprising missionary, with the assistance of some Hottentots, has succeeded in diverting a small portion of the river to their institution.

Their crops are spoken of as something fabulous; and I believe they nearly recouped themselves in the cost of the aqueduct, out of their first year's harvest.

Before leaving this locality, I might point out the position of the Van Wyk's Vley Reservoir, which is a splendid piece of work, completed about two years ago; but being wholly dependant on thunderstorms, it may be years before it is filled. At present it contains seven feet of water, whilst it has a holding capacity for three times that quantity. I mention this merely to show the uncertainty of dams for irrigation as compared to running streams.

II. The next river is the Olifant's River, of the Clanwilliam Division. When it overflows its banks, which happens at intervals of three and four years, marvellous crops are raised. The extent of arable ground inundated when such overflow takes place, does not exceed 4,000 morgen, which is made up of narrow strips of rich land along the banks of the river near the homesteads of the farmers residing there.

The fall of the river is only eleven feet in almost twenty miles, so there is no way of irrigating by means of an aqueduct. Many other schemes have been propounded by means of weirs, &c., &c., and at estimated sums, varying from £40,000 to £60,000—which amounts, if anything, are insufficient to cope with a river of such magnitude. But even if these amounts did suffice, "the game is not worth the candle."

The case might, however, be met in the following simple way, viz.: by the construction of a flat-bottomed barge, drawing eighteen inches of water, to be worked by a twelve horse-power engine, with its gear so arranged as to work a powerful force pump with India-rubber hose attached, to conduct the water wherever it is required along the banks of the river. This barge could go up and down the river, and its services be utilized wherever it is wanted; at the same time filling storing-dams, which might be provided by the farmers at their own cost.

An arrangement could be made with the farmers to pay for their water supply in proportion to the quantity of seed

sown, which would impose a very slight tax on them, as the cost of the barge, with hose complete, will not exceed £1,200. As the land there only requires one good wetting, to raise any crop of cereals, the barge will barely have irrigation work for three months in the year.

A small crew of three men would suffice to work it When there is no irrigation, the expenses of the crew might be recouped by employing them in fishing at the Olifant's River mouth, where fish is most abundant, and would command a ready sale if properly dried and cured.

III. The Hol River, called Doorn River near its source, is a tributary of the Olifant's River. The land along its banks is quite as fertile as that of the Olifant's River, but there is a much greater extent of it, part of which is Crown land.

The river is periodical, and is very shallow, capable of being diverted in many places, and spreading its waters over rich beds of alluvium.

Five or six thousand pounds spent there in a judicious way, would make the Government ground—which is unsaleable at present—most valuable. Like the Olifant's River, the soil there only requires one good wetting to raise a crop.

The finest raisins in the colony are produced on similar soil, at a place called "Atties," which adjoins the Hol River.

IV. The Breede River, near its source, has a very low watershed, dividing it from the Little Berg River at the Ceres Road railway-station, in the neighbourhood of which some enterprising farmers, years ago, diverted a small portion of that river into the Tulbagh Valley by means of an ordinary aqueduct. The Waverley Wool-washery, which commands a body of water equal to 120 horse-power when requisite, is worked on the upper part of that aqueduct, and the water is then allowed to run back into the Breede River.

If the aqueduct, which averages about two feet in depth, is enlarged, the whole of the Breede River might be brought, first into the Tulbagh Valley, where water is scarce in summer, and then it could be arrested by means of an ordinary weir in Tulbagh Kloof, and brought over an area of about fifteen square miles of good land, lying between the Piquetberg and Hermon railway stations. In this area there is a small periodical lake, called Vogel Vley, which, in good seasons, is three-and-a-half miles long, and one-and-a-

half wide, but having a very large holding capacity, might be quadrupled in size by the winter surplus water being allowed to flow into it.

Through the whole length of this tract of land, the railway passes, making it a most desirable area for an irrigation scheme. The land belongs to about eight or ten proprietors, but it could be purchased at a reasonable rate, and subdivided into small farms, upon which hundreds of agriculturists could make a good living.

V. At the confluence of the Hex and Breede Rivers, below the town of Worcester, the latter river might be diverted and brought into the rich valleys of Robertson, where there are thousands of acres of rich land uncultivated for want of water. This would not be a costly undertaking.

VI. The River Zonder End, a permanent stream in the Caledon division, if diverted at Tiger Hoek—Mr. Vigne's place—could be brought into the extensive Swellendam Ruggens, and turned to most valuable account, as the soil is very rich there, but for want of water is not cultivated.

VII. The Buffeljachts River, in the Swellendam division—a permanent stream—might be diverted and brought over an extensive tract of rich land, now merely used for grazing, near Port Beaufort, a sea port, and turned to most valuable account.

In like manner there are many small but permanent streams that could be utilized, but as time will not admit of my going into details, I shall pass them over.

As an instance of the advantages derivable, even from a small diversion, I might mention that while engaged as an assistant to my late father, when he was constructing the mountain pass called Bain's Kloof, I found that the Wit River—a mountain torrent running through Bain's Kloof, and into the Breede River—could be diverted and brought into the Wellington Valley, where water was then *very* scarce in summer.

This diversion was successfully carried out, at a cost of £1,400, and the Wellington Valley is abundantly supplied with water now, not alone for irrigation purposes, but several mills are worked by that stream. In this way many mountain streams in the immediate vicinity of Western towns might be diverted with advantage. Even the water supply of Table Mountain, now running into the Atlantic Ocean, could be diverted into the suburbs and city, at a small outlay, and turned to most valuable account.

Some years ago it was mooted in the Parliament that the

upper branches of the Orange River might be diverted from the neighbourhood of Aliwal North, and brought over a low watershed to the west of the Bamboes Berg, and then down the rich valleys of the Fish River, through the Middelburg and Cradock divisions to the most central portion of the Eastern Province.

Not being well acquainted with all those localities, I am unable to give a definite opinion, but from what I have ascertained on good authority, I believe it is quite a feasible scheme.

Everything cannot be done at once, but if convict labour could be applied to this scheme in the East, and to the one along the Orange River in the West, the colony, in a few years, would reap a golden harvest from such undertakings.

XI.

WEIR-SYSTEM OF IRRIGATION, WITH SPECIAL REGARD TO THE RIVERS OF THE COLONY:

A MEMORANDUM

By Patrick Fletcher, *District Inspector Public Works Department.*

[The following remarks are the outcome of the discussion, which followed the delivery of the Lecture by Mr Bain, on Water-finding, &c. Their originality and usefulness were deemed of too valuable a nature to be passed over cursorily; and in compliance with the request of the Exhibition Committee, Mr. Fletcher, subsequently, furnished them in writing, together with copies of the sketches made by him, to illustrate the system he then put forward.—Editor.]

The difficulty of propounding a general scheme of Irrigation is owing to the difference of climate in the various districts of the colony; the irregular distribution of rainfall, which varies from almost rainless tracts of country to localities receiving, annually, upwards of 40 inches; and the remarkable variety of soil—from that requiring several applications of water to ensure an ordinary crop—to soil which will yield, not only a bountiful return to a sowing with one saturation of water, but also, in some instances, will produce a profitable return to a second sowing, without receiving additional moisture from the surface. And to these conditions, add also, the variety of the geological structure of the colony, the general want of knowledge of these conditions, and the, comparatively, fruitless discussions which have taken place on the subject of irrigation for many years past.

After having been intimately acquainted with nearly every part of the colony, from the mouth of the Orange River to near its higher waters, on the mouth of the St. John's, and given careful attention to the climatic and geological features of the country and its water resources, during the past thirty years, my firm belief is, that there is no district of the colony in which irrigation may not be more or less developed in it, according to local circumstances; and, that certainly, our extensive tracts of land at present unoccupied, owing to want of drinking water for cattle, can

be profitably utilized, if we only carefully study, and take advantage of the secret operations of Nature, so strikingly illustrated in Mr. Bain's lecture, just delivered, on Water-finding and Irrigation.

My object in making these remarks is to draw attention to a system of irrigation which has hitherto been almost entirely overlooked, but which, I have no doubt, will ultimately become indispensable throughout the colony: I allude to a weir system of impounding water.

The plans for irrigation which have always been, and still are, in vogue with us, may be briefly classified as follows:—

1st. The leading out of water, from rivers directly into irrigating furrows by means of weirs, temporarily or permanently constructed, simply for raising the level of the water, or for directing its course.

2nd. The collecting of water into dams at or near to springs.

3rd. The constructing of dams for the holding of water obtained from surface drainage, called by the farmers *wim-dams.*

4th. Constructing dams in the beds of periodical water-courses.

5th. The constructing of dams on favourable sites, selected independently of local surface drainage, and fed by means of furrows from permanent rivers, or from water-courses which only have running water in them after thunder-storms, or ordinary rains.

All these plans are very important, and each one must come more and more into use in the localities for which it is specially adapted, although, it may be here observed, in reference to sites for reservoirs on a large scale, that it is remarkable how seldom a site is met with suitable for constructing a capacious reservoir, possessing *all* the desirable conditions, physically and otherwise, so as to meet the wants of a district, or even a field-cornetcy.

A simple, inexpensive and a most feasible plan for general adoption, in my opinion, and one that will not interfere with any of the plans at present in use, as referred to above, but will materially assist most of them, is, undoubtedly, the formation of numerous weirs in all our rivers, with the express object of impounding water in the dry season, or when rivers are in their normal state, and if need be, of raising the water's level at the same time.

The advantage of this impounding weir system arises chiefly from the fact that, most of our rivers cease running, or nearly so, when water is most required. These advan-

tages are, to some extent, recognised, but not as fully as they ought to be, and it may be as well, shortly, to enumerate them here.

1st. Rivers are the natural drains of a country, and all the rain water falling within their watersheds, which is not absorbed by the soil, or evaporated, gradually and surely gravitates towards and into their beds.

2nd. Few, if any, of our rivers are so rapid in their flow, or run so deeply, or are so irregularly worn into the surface, as not to present, every here and there, along their courses, from their highest parts 6,000 feet above sea level and downwards, extensive reaches* caused by rocky reefs, or volcanic dykes crossing their channels, and admirably adapted for sites for weirs.

3rd. A general weir system will retain permanently, on the land, a large amount of the rain water which now runs uselessly to the sea. This water will not only be conserved for immediate use, but it will likewise greatly strengthen the underground waters, whence come our springs, by the constant percolation, which will go on through fissures, laminations or partings, in the rocks with which it is in contact.

4th. Water impounded in this way in river beds is very largely protected against evaporation, not simply by its mass, but by the shelter afforded by the river banks, from the prevailing dry, parching winds; and this natural protection can often be easily increased by the planting of suitable trees along either side.

5th. A weir system will neither interfere with, nor encroach upon, the riparian rights of those lower down the river, for every farmer who constructs an impounding weir obtains a supply of water for his own use, and at the same time adds to the water resources of his neighbours. Experience proves that the more weirs there are in a river, the more permanent will be the river supply. Springs likewise frequently exist in the beds of rivers during droughts too weak to be utilized, but which, with an impounding weir, might be turned to profitable account.

6th. Rivers, as a rule, form the boundary lines between farms (along which are generally situated the farmers' sowing lands), and in the making of weirs across their channels, opportunities will be frequently given for co-operative works among owners of adjoining farms.

* Rivers, or water-courses, frequently meander, or wind, with so little fall even in rugged parts of the colony, that I have had myself occasion to test three, four and seven miles of sections of a dead level in this description of country.

7th. An impounding weir need not be made in the river close to the furrow, by means of which the water is to be led out for irrigating purposes, but it can be made higher up—even some miles—if by so doing a more suitable spot is obtainable—the water in this case being allowed to flow from the weir down the bed of the river to the intake of the irrigating furrow as required. A case may also easily be supposed, in which a farmer would find it advantageous to construct his impounding weir above a neighbour's weir, and to obtain the right of using the water, thus conserved, by passing it through the neighbour's weir to the intake of his own irrigating furrow.

With the advantages of the impounding weir system thus plainly before us, it may be asked: How is it that such weirs are not already common in the land? The answer is to be found in the facts, that farmers have been slow to realize the necessity of doing more than raise the level of the water in a river,* and the difficulty experienced in keeping storing-dams in river-beds, free from silt caused by floods and freshets.

Plans have been designed for allowing the scouring out of such accumulations by movable dams, self-acting sluices and like appliances, but none of them appear, to my mind, to be suitable for the present circumstances of our farming population.

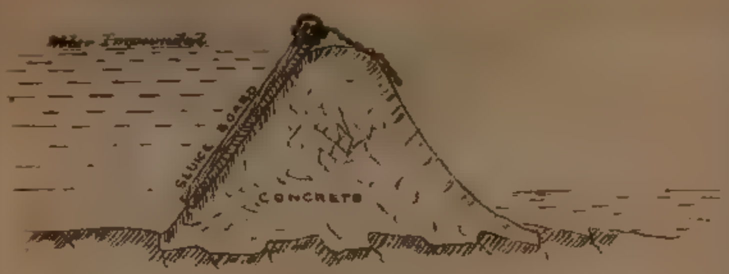
The remedy for the removal of these stumbling blocks in the way of the general adoption of the impounding weirs, which I advocate, and which I believe will prove of immense benefit to many parts of the country, is to be found in the building of weirs on the following principle, which is simple, and, as far as expense goes, within the reach of most farmers.

Let the site of the weir or dam in the river be chosen at the lower end of a reach, where there is a rocky bottom, if possible, and here, right across the river bed, build a wall of concrete,† say from 2 to 5 feet high, with the base equal to

* For instance, four years ago there were twenty-nine weirs on the Swaart Kei between Doorn Hoek and the junction of the Klipplaat, in the district of Queen's Town, solely for raising the water to the level of the furrow. These weirs or "dams," vary from 2 to 14 feet in height. They are formed of dry stone walls; and they are nearly all, more or less, damaged every year, and occasionally washed away entirely.

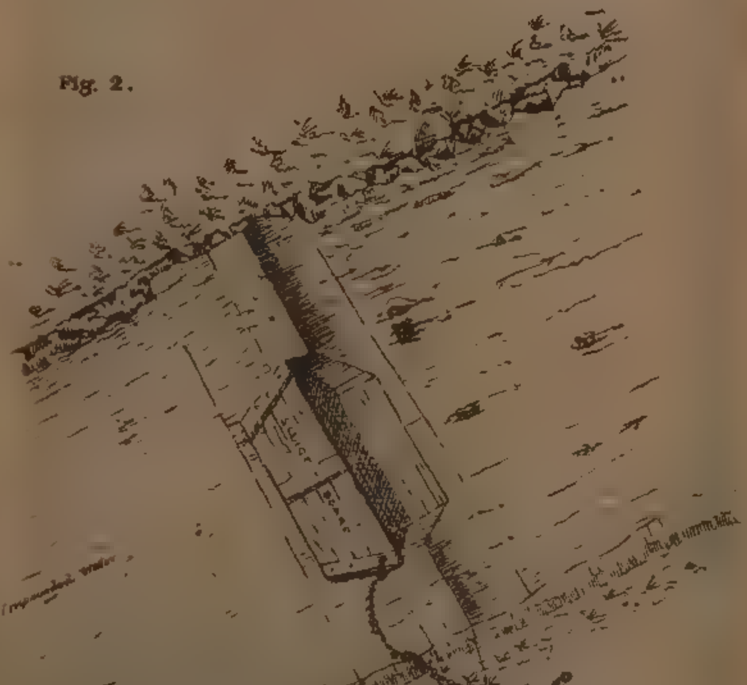
† A cask of cement weighs about 400 lbs., which makes this useful article expensive inland. In the Western Province, we have the "Five Sisters," and many miles southward composed of compact vitrified impure yellowish limestone. In Clanwilliam, Piquetberg and Worcester greyish limestone. The same greyish limestone occurs in the Eastern Province at Hankey; at Mount Stewart calcareous boulders; at Alexandria and Bathurst a white

Fig. 1.



Cross section of Weir

Fig. 2.



SKETCH OF WEIR.

Designed for a "reach" on the Ind

its height, and bevelling off at the top to about one-fourth. Of course the height will vary according to the nature of the river and the means of the farmer. At about the centre of this wall an opening must be left in it which will extend down to within about a foot of the river's bed, say 5 feet wide at the bottom and 9 feet at the top, or in any other similar proportion. (Fig. 1.)

This wall is what may be termed, the permanent weir, and must be carefully made. This should be no difficult matter, seeing how well known now-a-days is the making and moulding of concrete, and that the best materials for it, save cement, are always on the spot. Additional stability can be given to the wall, when there is a rock foundation, by inserting iron stanchions into this rock through the mass of the concrete.

In the opening left in this concrete wall, a sluice-board must be placed, resting closely on the smooth inner edges of the bevelled wall, and in this position it will be kept by the water collecting on that upper side. This sluice-board, strongly constructed of deal, with a lap of 4 inches on the concrete wall, will remain perfectly steady without bars or hinges, until removed by a flood, or by hand, or a mechanical contrivance, which latter can be readily effected by pulling the anchoring chain the extent of the lap, when the board will float, and be safely moored alongside of the river bank. (Fig. 2.)

This removal of the sluice-board during floods or freshets will secure the scouring out of the dam; and when the river has subsided, the replacement of the board will be an easy task. Instances will, no doubt, occur in which, owing to the breadth of the river, it will be well to have two or more openings in the permanent weir, with sluice-boards; and in other cases it may be advisable to have the sluice-board in two or more sections, or even in single planks, the one resting horizontally on the other, with fastenings, having a slack of a few inches between each plank, so that in the hauling on the anchoring chain, one plank after another is relieved from the permanent weir, and floats to the side of the stream: but these are details apart from the main question.

The characteristics of our rivers are so various in the

sand limestone; at Katberg septaria, in the Queen's Town district, a remarkable outcrop of impure limestone. There are also other calcareous beds overlying the notorious "Claystone Porphyry" or "Trap Conglomerate." Samples of these and of the various strata of blue lias and volcanic tuffs might be submitted to the Colonial Analyst with the view of making a selection for manufacturing cements and hydraulic limes in the colony.

matter of silt, duration, and heights of floods and freshets, composition and fall of their beds, &c., &c., that they cannot be too carefully studied in these respects, in order to design the weir according to the specific conditions encountered in the particular river to be dealt with.

The permanent weir may be constructed of masonry, timber, or any other material at hand, which can be utilized for the purpose.

Concrete or masonry weirs, for example, are well adapted for the Karoo plateaus, where many of the rivers have long reaches with nearly horizontal rocky beds exposed.

It may be frequently advisable to make the openings in the permanent weirs several feet above the bed of the river, which will have the effect of creating silting, or rather warping, thereby raising the bed of the river to a convenient height, and at the same time increase the impounding area of the weir.

Having due regard to the nature of rivers, in this and other respects, on the Karoo plateaus alone, I believe hundreds of miles of sheets of water may be thus impounded, and applied to lands either by gravitation, or raising it a few feet by wind power, or other simple appliance, where at present every freshet runs off in a few hours, or a few days, leaving the channels devoid of moisture.

The broad principle of the construction of these impounding weirs has been stated, and as it is carried out into practice, modification can easily be made according to the requirements of individual cases.

I may here, in conclusion, refer also to those inestimable blessings to the Colonial farmer, "Sea-cow Gats." These are simply natural weirs or dams. They are generally a few hundred yards, and not unfrequently, a mile in length, full of water, when no running water exists in their locality, and are mainly kept free of silt by the angle of depression at which a freshet or flood enters them. The thrust thus given to the under stratum of the current has a scouring tendency, and this, combined with eddies, keeps the silt in agitation until it is ultimately carried off. An exceptional flood may occur which will neutralize those conditions, that is, the conditions which are required to maintain the "Sea-cow Gat," and for a time fill it with silt, but it, generally, soon regains its normal character.

Farmers prefer that their weirs, which they only use for raising the water level, shall create silting, as thereby the structure is strengthened, and they are frequently disappointed, when no silting takes place.

It follows, then, that where we can adhere to the condi-

tions which create and maintain "Sea-cow Gats," we can construct permanent weirs on our rivers requiring no provisions for silt or floods.

In submitting the above remarks to the consideration of our farmers, I can only hope some will give them practical application, and so prove the value of a general impounding weir system for irrigation and other purposes. In fact I have long been convinced that the general adoption of this system will, ultimately, convert our periodical rivers into the much desired conditions of permanent rivers, having always in their beds more or less running water for the farmer's use.

XII.

UNDERGROUND WATER SUPPLY, WITH SPECIAL REFERENCE TO THE COLONY.

BY THOMAS STEWART, ASSOC. M. INST. C.E., F.G.S., *Hydraulic Engineer's Department, Cape Colony.*

THE existence of springs and of supplies of water underneath the surface of the ground has in all countries led to a popular belief that, there is an inexhaustible supply of water underground, and that we have only to dig deep enough in order to find it, under conditions capable of causing it to rise to the surface in quantities sufficient to convert arid countries into veritable Edens. This belief, although in some cases well-founded, is not in general based on a careful consideration of the conditions which are necessary for the existence of stores of underground water; on the contrary, the belief is too often based on a mere supposition that, because some springs have been increased by judiciously opening their "eyes," all springs can be similarly increased. The source from which springs derive their supplies is not infrequently entirely forgotten, and the characteristics of the country utterly ignored.

If our search for underground water, and the most suitable positions for wells, is to be based on something more tangible than guesswork, regard must be had to a variety of circumstances, some of which I shall now proceed to discuss.

SOURCE OF UNDERGROUND WATER.—Rainfall is the source of all underground water. Of the quantity that falls from the clouds a large proportion sinks through the soil and percolates through the underlying rocks until it reaches an impermeable bed, which under certain conditions causes it to be thrown out again in springs or stored so as to form underground reservoirs, capable of yielding water to wells sunk into them.

That springs owe their supplies to rainfall is proved by many of them becoming weak or ceasing altogether after long droughts, and being replenished after rains. Springs owe their permanency not so much to the quantity of rain which falls in a given district as to the area from which they

draw their supplies, and upon the capacity of the rock to retain and regulate the water which reaches it from the surface. Although rocks composed of porous materials, much fissured and cracked, afford by far the best conditions for percolation, yet it has been proved that no rocks are absolutely impermeable to water. Even in the driest mines the sides are usually wet by water oozing through the pores of the rock. With these facts before us there need be no hesitation in admitting that, subterranean waters, however deep-seated their apparent source, came originally from the surface, and are due to the rainfall.

Such being the case, it naturally follows that, districts favoured by regular and copious rains are, other things being alike, better able to yield large and permanent supplies than districts in which the rainfall is scanty and uncertain. In estimating the quantity of water to be obtained by sinking wells and bores in a given district, it is obvious that we cannot assume that the whole of the rainfall will be available, for the greater proportion, instead of percolating into the earth, goes off in other directions. The determination of the proportion which actually sinks into the ground, to be brought up again to the surface by wells and springs or to remain stored underneath, is a problem of the utmost importance to an arid country like South Africa. This quantity is influenced both by meteorological and geological circumstances.

The former may be conveniently divided into:—

The rainfall—its season of falling, and its heaviness or rate of falling.
The temperature.
The humidity.
The prevailing winds.

The rainfall of the Cape Colony, like that of all other countries, is exceedingly varied in amount according to the district in which it occurs. At Pella, on the north-west border, the average yearly fall is only 2¼ inches, one-fifth of which falls in May; for five years there has been no rain during November. In the south-west part of the colony, there are copious rains, the greater proportion of which falls during the winter months; for example, at Malmesbury the yearly fall is 17½ inches, of which about half falls in May, June and July; at the Royal Observatory 25 inches of rainfall yearly, three-fifths of which occurs in the winter months. At Mossel Bay, and at Port Elizabeth, as well as

at most coast towns, the rainfall is irregularly distributed throughout the year. The annual fall at the former town is 16 inches, at the latter 23 inches. At Mossel Bay the wettest months are February and March; at Port Elizabeth May and October. The driest month at both places is January. At Carnarvon, a town in the northern Karoo, and fairly typical of that district, the average is 8 inches, one-fifth of which falls in March. From June to December inclusive, the average for any month seldom exceeds half an inch. At Graaff-Reinet, in the East Central Karoo, the average is 14½ inches, and the wettest month March. Queen's Town and Aliwal North, towns on the eastern border, have average falls of 20¾ inches and 24½ inches respectively. Their greatest rains generally occur in February and March, and their droughts in June, July and August—in these respects resembling what occurs in the Karoo. Generally speaking, the north-western districts are almost rainless; the Karoo districts are better supplied, but as the greater portion of the rain falls in heavy, torerntial showers, during the hot months, when the ground is dry and parched, there is a great loss from evaporation and other causes, so that in addition to receiving very little rain, the little they do receive is, to a great extent, taken up again into the atmosphere. As the south-west districts receive their rains during the cold winter months, when evaporation is least active, a greater proportion percolates into the ground. It is, therefore, obvious that, a well sunk in the Karoo country cannot possibly obtain so much water as one sunk under the same conditions in the south-west part of the colony.

As an example of how the season affects the proportion of rainfall which percolates into wells, the case of Croydon may be quoted. This town derives its water supply from the chalk—one of the best water-bearing formations in England. The engineer states that, a large part of the rain falling never influences the quantity of water in the springs in the slightest degree. In one year between the "beginning of May and end of November, although over 12 inches of rain had fallen at Croydon, the rainfall did not affect the quantity of water in the subsoil, but during the whole of this period both the volume of water flowing from the spring and the height of water in the subsoil steadily diminished." Over the district of Croydon the rain falls—as it generally does throughout England—at frequent but irregular intervals. The annual fall is between 24 and 26 inches, but this is not a safe index to the quantity available,

for it is found that, unless there is a good rain in December the wells become weak in the following spring.

We may conclude from this that, in temperate countries, with frequent but irregular rains, permanent subterranean well—or spring—supplies, receive rarely more than a very small share of their yearly replenishment during the warmer months of the year, their continuous flow being dependent upon adequate subterranean storage.

The rate at which rain falls has an important effect on the proportion which percolates into the soil; for instance, some observations made in France show that, a rainfall of fully 3 inches in an hour and a half only penetrated into the soil to a depth of 2 inches, whilst a "fine rain," in the month of July, which gave a fall of only 1 inch in 7 hours, penetrated the same soil to a depth of about 4½ inches. In the Karoo and other districts subject to thunderstorms, the rain often falls in a few heavy, torrential showers, while on the coast and in the south-west districts, there will be continuous rains for some days, the total quantity being comparatively small. Rains of the former class are the most suitable for dams, while springs and underground water supplies are better served by rains of the latter class.

The temperature of the air exercises a strong effect on the quantity of rain that finds its way into the ground: the higher the temperature the greater the amount of rain evaporated. Owing to this cause much of the rain which falls in the Karoo is lost. The effect of heat is, to a great extent, neutralized if there is moisture in the air; in fact, evaporation may cease altogether from this cause. Unfortunately for the prospects of underground water supply in the Karoo, the air is so extremely hot and dry, that so soon as a rain stops, the water on the surface is quickly taken up again into the atmosphere. The effect of wind is largely to increase evaporation; and in the Karoo this effect is increased by the local character of the rains.

The am unt of underground water from a given amount of rain is intimately connected with the geological character of the ground through which it has to percolate. Some experiments made in England, on the common surface soil, derived from the new red sandstone, containing a good deal of clay, allowed 8¼ inches to infiltrate out of a total annual rainfall of 33½ inches, or 25 per cent.; the light, gravelly soil peculiar to the chalk districts, gave 39 per cent.; while a heavy soil, derived from the magnesian limestone, yielded only 20 per cent. A sandstone is the best conductor of water; but if the grains are too small its capacity will be

decreased. Loose sandy soils admit of ready percolation, but if the same material be firmly consolidated its capacity for absorption is diminished; clay in sand, while enabling the latter to hold more water in suspension, retards its passage downward. In the experiments made in England, 3 feet was assumed as the limit of depth to which evaporating influences extend. This depth, however, cannot be accepted in this country, for the excessive heat dries the surface so thoroughly that, water is drawn by capillary attraction from much greater depths. We have evidence of this in the white limestone tufa or "kalk," which overlies great tracks of the Karoo strata, and fills its fissures to considerable depths. Here the rain water, in its downward passage, has dissolved some of the minerals, but as the surface became parched the water was drawn up again by capillary attraction and evaporated, the limestone, which it held in solution, being deposited at the surface and in crevices of the rock.

The rate at which water permeates rocks is a problem which it is specially necessary to solve when the increase of underground water is greatly dependent on torrential showers, as in our Karoo districts. Sandstones, the only water-bearing rocks in the Karoo, admit of a fairly rapid percolation, while the shales and clays with which they are interbedded and covered, are practically impervious; between these extremes there are rocks of all degrees of permeability.

With regard to the effect of the character of the country on the amount of rain water which passes through it, plains and gentle slopes covered with sand absorb nearly all the rain which falls upon them. Tracts of country, composed of bare rocks, fissured and cracked, with openings to water-bearing beds beneath, are almost as good, especially if not mountainous in character. If, instead of the surface being bare, there is a certain amount of superficial soil, mixed with a large percentage of partially decomposed rock, a variety common enough in the Karoo, small showers would be unable to reach the lower rocks owing to the retention by the soil. If, however, the rain is sufficient to supersaturate the soil, the excess passes downward. Where the underlying rock is a slow conductor of water, superficial soil of a porous nature, especially if covered with bush, acts as a feeder for some time after the rain has stopped falling.

The method of herding stock in vogue in the Karoo, is highly detrimental to underground water supply. The herds are in constant movement from one part of the farm to another, in search of fresh veld, or for watering purposes. They thread the ground in their journeys, and form paths,

which allow a ready exit to the rain water, and ultimately, turn into sluits. A few wells, judiciously sunk, at various places on the farm, would, at any rate, save journeys for water, and doubtless improve the veld.

The wanton cutting down of trees and bush throughout the colony, has done much harm, (1) by enabling increased evaporation to take place from the soil and from pools in the otherwise dry river beds; (2) by enabling the sun to bake and harden the soil.

A tract of country consisting of dense clays and shales allows scarcely any water to percolate. It is useless to sink wells in such districts, unless we have determined that, the underlying rocks are porous, and that they come to the surface at some point beyond the clay. If a clay-covered district is traversed by a regular valley system, the rain water will flow off it with little diminution; but if there are numerous basins and hollows, or "vloers," as in the flat tract of country which borders the Zak River, large quantities of the rainfall may be retained for weeks, or even months; but such lakes are of little use to the underground water supply, for their silt-covered bottoms effectually prevent percolation.

In the Karoo districts, it generally happens that, the water-bearing strata sandstones—lie between shales of an impervious character. The sandstones are fairly open, but as their outcrops are limited, owing to horizontal bedding, much of the rainfall never reaches them.

Where ancient rocks occur, as on some parts of the northern border, well-sinking is absurd, as the rocks are almost impervious.

In addition to the instances cited, there is an endless variety of others, the conditions of which require long study, careful experience, and judgment, before a reliable estimate can be formed of how much rainfall can be secured from a given drainage area, or what results are likely to follow the sinking of wells into a given water-bearing formation. It will, naturally, occur to most of you that a colony, the farming population of which must at all times depend upon springs and wells for drinking water and for water for stock, should know something of the prospects of obtaining water in certain rocks, and the quantity that a given area is capable of yielding; yet, curiously enough, there are no reliable observations available, nor am I aware that any facilities have been given for the purpose.

The British Association, some years ago, appointed a committee to investigate the circulation of underground

water in the water-bearing strata of England. Having collected all the available information regarding the drainage areas of certain districts, the relation between the yield of springs and wells, and the rainfall of the area from which they drew their supplies, together with observations on the fluctuations of the wells, the committee was able to form a fair estimate of the prospect of obtaining water in certain districts. As instances, it was found that in the N.E. of England, where the Triassic and Jurassic strata are largely developed, only certain beds are water-bearing, viz., the sandstones and limestones. Districts composed of magnesian limestones appear to yield 10 inches of its annual rainfall, by means of springs; while the districts composed of oolitic rock, are not believed to be capable of yielding more than 5 inches. It is often stated that, one-fourth to one-third of the total annual rainfall is available in springs and wells in Great Britain, but if we have regard to the various factors that enter into the problem, we must conclude that, without a careful examination of the district under consideration, such an estimate is very much of the nature of a guess. Assuming, however, that one-fourth to one-third is a fair approximation in Britain, I think one-tenth to one-sixth is the most we can expect in the arid districts of this country.

GEOLOGY.—Hitherto I have confined my remarks to the conditions which affect the quantity of rain that finds its way under the surface. Its subsequent history is so interwoven with the character of the rocks and the disturbances that they have undergone, that a description of these is absolutely necessary, if we are to understand the causes which produce springs, and tend to successful well-sinking.

The rocks composing the crust of the earth may be classed, according to their mode of formation, as *aqueous* and *igneous*, that is, rocks formed by the agency of water and rocks formed by the agency of heat. Rocks belonging to the first-class were originally laid down as sediments in the bottom of seas or lakes, the materials having been derived from the wearing down of previously existing rocks. The process is thus described by Prof. Ramsay:—" Suppose a river flowing into the sea, it carries sediment in suspension, and a layer will fall over a part of the sea bottom, the coarse and heavier particles near the shore, while the fine and lighter matter will be carried out and deposited further off. Another layer of sediment will be formed on the top, and another, and another, until, in the course of time, a vast accumulation of layers may be produced." The accumulations of strata thus

produced become consolidated by various agencies, and are, ultimately, elevated as dry lands, forming continents or islands. South Africa is, with a few exceptions, composed of sedimentary strata. Some tracts, such as those covered by the Zwartbergen and other ranges, have been much contorted and changed by movements of the earth's crust, while the Karoo rocks, which are much younger, deviate very little from the horizontal position in which they were deposited. Had these rocks been slightly tilted up and let down, so as to expose the water-bearing rock, and form basins, they would have been very much more important in respect of their water supply. As it is, the strata seldom outcrop, except where cut by valleys. [Figs. 6 and 7.]

The sedimentary may, for purposes of water supply, be divided into conglomerate, sandstone, and shale. Conglomerate is composed of the coarsest variety of the water-borne materials, gravel and pebbles, cemented by finer grained material. Its texture is usually coarse and open, consequently it is generally one of the best water-bearing rocks. Sandstone is a finer-grained variety of conglomerate, which, if fairly pure, is capable of storing large quantities of water. I have already pointed out that this is the water-bearing rock in the Karoo. Shale is merely consolidated clay or mud, with various proportions of sand in its composition. Generally it is all but impervious, and if it covers sandstone rocks it effectually prevents rain infiltrating into them. Although useless as a water-bearing rock, its presence, as an intercalated layer, is of immense importance in the economy of springs, for if it underlies pervious strata, it intercepts the downward passage of water, and causes it to flow along its surface until it finds an outlet, or failing an outlet, causes it to be stored in subterranean reservoirs. Without shaly strata, artesian wells would scarcely be.

When alternate layers of sandstone and shale form the upper rocks of a district, it must not be assumed that because rain rapidly disappears in the case of sandstone forming the surface, that the deeper-seated rocks directly below are water-bearing. The clay or shale may divert the percolating water into another drainage area.

I have not included limestone in the list of sedimentary rocks, as some of them are of organic origin, and some formed from chemical solution; but their consideration must not be lost sight of in questions of water supply. The chalk—a variety of limestone—is one of the best water-bearing formations in England, one of the great London water companies drawing its supply from that source.

Frequently large bodies of water enter limestone rocks by means of fissures, which they widen by mechanical and chemical action, so that important subterranean water-courses are formed. The caverns, so common in Derbyshire, and other parts where limestone or chalk occurs, doubtless owe their origin to similar causes. The Kaap Rand, in Griqualand West, is composed of a siliceous limestone, which yields innumerable springs all along its south-eastern outcrop. At Campbell Town, there are about twenty springs within an area of two square miles. The water issues from fissures in the limestone, which fissures extend into the rocks for miles, as there are hollows and basins six to ten miles distant, which, I am convinced, feed the springs.

Dr. Holub, in "Seven Years in South Africa," describes some curious springs which he met with in the Transvaal, in a limestone, which is probably a continuation of that which forms the Kaap Rand.

To return to the geological features. The succession of beds of different composition represents the conditions which prevailed over a certain area during the deposition of any one bed; the lower is the oldest, the upper is the newest. Beds seldom preserve the same thickness throughout the whole of the area of their occurrence, but frequently thicken or die out rapidly, a contingency to which regard must be had when we attempt to estimate the quantity of water available at one point of a district from the results obtained at another. As some beds are of better capacity than others, so are some groups of strata, or "formation," as they are generally called. The best water-bearing formations of England, are the New Red Sandstone, the Chalk and the Oolite. The presence of similar rocks in other countries affords presumptive evidence that underground water may be found in them, if properly sought for, a presumption which has lately been verified by the discovery of water, at great depths, in the chalk of Australia. Igneous or trap rocks as they are generally called, occur in this colony as sheets and dykes. Their presence at the surface of the country is indicated by long low ridges, covered by brown boulders or "yzerklip." The trap dykes extend downward for unknown depths, forming subterranean dams or weirs. Where neks occur, but more usually where the dyke has been cut through by a river, springs generally occur at or near the surface. The Karoo is traversed by thousands of these dykes, which may be seen in their most characteristic forms in the vicinity of the railway, between De Aar and Cradock, and eastward from there towards the Orange River.

During the consolidation of rocks and the movements of upheaval and subsidence which are constantly taking place in the earth's crust, the rocks are subject to stresses and strains which have produced joints, faults, undulations and outcrops. Except for joints, it would be difficult for water, in many cases, to penetrate into the depths of the earth, in fact, "the joints form natural lines for the passage downward and upward of subterranean water." The movements which have bent and curved some rocks, have in others produced fissures and dislocations. When the continuity of the beds are broken, as at F, Fig. 8, the term "fault" is applied to the fracture. The appearance of edges of strata at the surface is termed its outcrop. Where rocks exhibit but slight inclinations and undulations, the lower beds seldom outcrop at the surface, except where valleys have been eroded so as to reveal, along their sides, outcrops of the strata. This is a feature characteristic of the Karoo country, and interferes with its water-bearing capacities. If we are to form a fair estimate of the quantity of water which finds its way into an underground reservoir, we must carefully examine the nature of the outcrop, the extent and configuration of the ground, and the possibility of the outcrop deriving a portion of its supply from the higher rocks. Faults and fissures interfere so much with underground water that disregard of them is sure to lead to failure. In Fig. 9 there is a vertical displacement of the rock, so that a face of clay is brought against the lower part of the sandstone on the east side. In this case, though there may be small springs at S, yet the main body of water, percolating through the sandstone, will pass, laterally, along the line of fracture.

I have just said that, we must carefully examine the nature of the outcrops of permeable strata. This is all the more necessary, because stiff impervious clays sometimes overlie water-bearing strata, causing the rain which falls upon them to run off in streams. A casual examination is sufficient to show that, the outcrops of deep-seated rocks are generally overlaid by soils and accumulations of very various degrees of porosity. Geologically they admit of division into three classes: (1) those derived by disintegration from the underlying rocks; (2) those brought from a distance by wind and water, and having no relation to the underlying rocks; and (3) those due to plants and animals. With regard to the first kind, granites produce stiff, retentive clays mixed with sand, which are practically impermeable; trappean rocks produce light, porous soils, which

absorb water with avidity; sandstones produce variable soils according to the proportion of clay in their composition, as a rule they are open and porous; shales and marls produce stiff, retentive clays, many of which are almost impermeable, and for this reason used for the puddle walls of dams; accumulations of the second kind comprise a very miscellaneous assortment of materials, consisting of large boulders, gravels and clays. They generally compose the lowest tracts of river valleys, as in the Zak River district, and on the borders of the Great Fish River. Accumulations of organic origin are so sparingly developed in this colony that further reference to them is unnecessary.

The existence of trees, bush, and vegetation, by breaking up the soil, and sending down roots, perform an important part in increasing water supply, a part which I regret to say seems to be unrecognized in this country.

CIRCULATING OF UNDERGROUND WATER.—Rain water is absorbed generally by the rock or soil at the surface, and percolates downward, partly by the interstices of the rock, but more frequently by fissures and planes of bedding, until it arrives at a point already charged with water, when it adds to the height of the saturated rock. Should there be an outlet at a sufficiently low level to enable the head of water to overcome the friction caused by the particles of the rock, a spring will result. If, on the contrary, there is no outlet below the general surface of the country, the water will form an underground reservoir, the plane of saturation of which may in heavy rains coincide with the configuration of the country. A well sunk in such a district would be certain to obtain a plentiful supply, but if the draw from it was excessive, the plane of saturation would, in the vicinity of the we l, be lowered, forming an inverted cone.

The reason why so many of the springs in this colony appear in the river beds is that, these beds are the lowest parts of the valley systems which they drain. The rain which penetrates into the surrounding high ground sinks downward until its progress is stopped by the saturated rocks, when it flows outward, its ready egress being retarded by friction. Could friction be removed, the rain would escape almost as fast as it penetrated the rock, and perennial springs would not exist. This friction prevents the water finding a general level, and causes it to be piled up, corresponding more or less to the contour of the ground. In dry seasons the water piled up by heavy rainfalls is, by the force of gravity, caused to subside and find outlets in the lower

parts of valleys. The slope of the plane of saturation varies greatly even in the same rock. In the chalk it varies from 12½ feet to 40 feet to the mile. In rainy seasons, of course, the slope is at its maximum, and at its minimum towards the end of dry seasons. Springs then become weak, owing to the head of water above them being unable to keep up the supply.

Having gone over the conditions which affect the quantity of water that may be met in the crust of the earth, I now pass on to the springs and wells, by which a great proportion of this water may be recovered.

SPRINGS.—Springs admit of a natural division into two kinds: first, those produced by a combination of porous and less permeable rocks; second, those produced by the breaks and dislocations termed "faults," which I have just named. Engineers, however, generally class springs as shallow or deep-seated.

SHALLOW SPRINGS.—The most simple form of spring is shown in Fig. 1. A is a porous rock, say sandstone, which allows ready percolation of the rain water until it reaches the impervious layer B. As it cannot pass through B it will accumulate until the line of saturation rises sufficiently high to enable the pressure of the water to overcome the friction caused by the particles of rock, when the water will flow outwards, and appear as a spring, on the line of junction.

Fig. 1.

A spring due to the conditions shown, besides being liable to contamination, will be unreliable, on account of the supply being directly dependent on the rainfall.

Should the bed of impervious rock be inclined, as in Fig. 2, all the water will appear at one side. Assuming, in the latter case, that the junction of the clay and sandstone occurs on the side of a valley, as frequently happens in parts of this country, we seldom if ever find a continuous line of wetness, but we find that the discharge is concentrated at certain points.

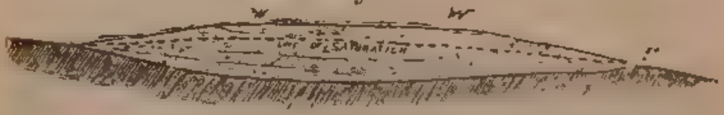
Fig. 2.

An examination of the arrangement of the rocks will, probably, show that there are undulations which cause the water to drain to low points, just as hills cause the surface waters to drain into the valleys between them. Rents and fissures act in the same way, by allowing side egress to the percolating waters. There are good examples of springs due to this cause in the Cape Peninsula, for instance: on the slopes of the mountain, on the north side of Vischhoek Valley.

Fig. 3.

Fig. 4 is a very common form of spring in deep superficial accumulations. The underlying clay B forms a basin, which holds up the water, and delivers it gradually, to the spring at S, on the same principle as lakes retain heavy showers of rain water, and give it out gradually, to the rivers fed by them.

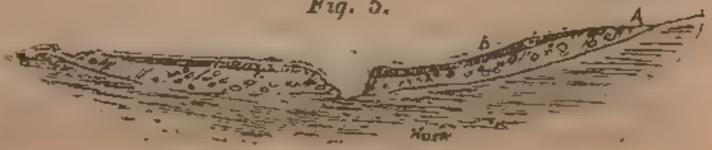
Fig. 4.



The line of saturation, shown on this figure, is such as would, probably, obtain when the rain was not too strong for the discharging capacity of the spring. If the rainfall should be excessive, the whole body of the sandstone would become saturated with water, which would afterwards be delivered from it at the lowest point S. In the event of a drought the line of saturation would descend, possibly to a level, when the spring would cease to flow.

A form of surface or land-spring, frequently met with in the river-beds of this country, is shown in

Fig. 5.



The tract of country bordering the river is generally composed of heterogenous materials, A covered by a silty soil, B brought down by the river when in flood. Assuming that the underlying rock is a clay, all the rain water which enters at the outcrop of A will percolate towards the lowest part, in this case the river-bed, when it will appear as an ooze or a weak spring. Similar springs may be due to some of the river water having found an entrance to the porous material at a higher point, as when a river describes a curve. We should be careful to distinguish between such springs and those which frequently appear from the solid rock forming the bed of the river. The latter often come from long distances, as shown in Fig. 6 and 7.

Surface or land-springs occur under so many forms that the diagrams shown can only be considered as illustrations of certain types. The springs themselves can be distinguished from deep-seated ones by the great variableness of their yields, which fluctuate according to the seasons, and, in droughts, often cease altogether; by the rapid response which they make to rains, and by their temperature changing according to the season. If surface springs are fed from the neighbourhood of dwellings, their waters are pretty sure to be contaminated from infiltration from cesspools, farm yards, and refuse heaps. While the addition of hurtful matter from these sources does not affect their use for irrigation, it renders them quite unsuited for domestic purposes.

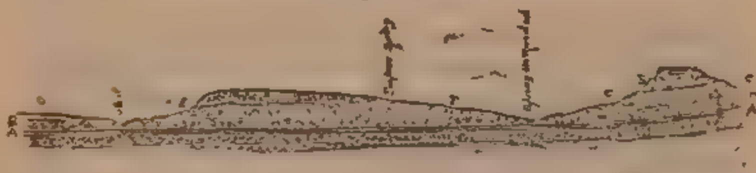
Deep-seated Springs.—Deep-seated springs are not necessarily at great depths below the surface, for their water may very often flow out at the surface; but because they draw their supplies from extensive areas, and frequently from great depths, a distinction is made between them and those which draw only from the superficial ground. Springs of this class owe their permanent and large supplies to the extent of their underground reservoirs, for, as pointed out in the case of Croydon, deep wells are dependent on the rainfall of certain months, rather than on a continuous infiltration throughout the year. It should be borne in mind that the greater portion of percolating water descends chiefly through the cracks and fissures of the rock. If, therefore, a water-bearing stratum has its outcrop partially exposed in a river-bed, in a hollow, liable to be flooded in rains, or in a rainy district, we may safely conclude that much of its spring water comes from one of these sources. I believe that in some of the Karoo districts an investigation would reveal that many of the pools left in the river-beds

after floods go to swell the underground water. Of course the supply of others is often kept up by percolation from the high ground around them.

Deep-seated springs are most frequently produced by breaks and dislocations, faults, although a few owe their origin to alternations of porous and less permeable rocks.

Fig. 6 is an example of a common variety of Karoo spring due to the latter cause. A is a bed of shale, B a bed of pervious sandstone, which in the middle of the figure is overlaid by another bed of shale, and this in its turn by another bed of sandstone. The hill on its right is capped by a sheet of trap. The rocks have an inclination or dip, as it is called, from both sides toward "spring in river bed."

Fig. 6.



One of the outcrops occurs in a valley beyond O, and as the rock is a sandstone, we may assume that it will absorb all the rain which falls upon it, and, probably, some of that which drains from the steeper slopes of the hill. As the surface of the sandstone between D and C is covered by clayey soil, very little absorption takes place in that area, but at O, the sandstone is again exposed, and may be expected to absorb the rain which falls upon it. In the case of rain falling on these outcrops, after a dry season, there will be a gradual percolation of the water from both sides until it reaches the line of saturation (not shown in the figure), when it will raise this line, and so produce an increased flow in the spring. If the sandstone is connected under the river-bed as shown in the figure, part of the water will pass to the left and saturate the lower part of the sandstone until it meets the flow from that direction. On the plane of saturation being raised sufficiently to overcome the friction in the strata between D and E, the spring will be further increased. In the case of a continued fall of rain, the whole body of the sandstone would become saturated with water, and a temporary spring be produced at the sluit. Owing to the long distance which has to be traversed by the rainfall before it finds an outlet, the friction retards the flow, thereby distributing the discharge throughout the year.

We have instances of this in some of the springs which supply Cape Town, only in this case they are caused by the water reaching impermeable granite instead of shale.

Fig. 7 is another variety of spring, common in the Karoo, which is, in some respects, akin to the last.

Fig. 7.

A is a layer of shale, B of sandstone, and above and below there are similar alternations of strata. The inclination is to the left. Sandstone forms the bed rock of the valley between O and C, but its porous qualities are lost, owing to the covering of impermeable clay, which causes the rainfall to run off into the stream. If, then, we find a strong permanent spring S at the foot of the mountain, we must look for its gathering area in the country to the right, when we shall, doubtless, find that the sandstone is not overlaid by clay. Should there be spaces in the area between O and C devoid of clay, or should the sandstone be much exposed in the river-bed, part of the rain which falls in this area will enter the sandstone—if it is not saturated—and produce temporary increases in the spring. If, on the contrary, the rock is saturated at the river-bed, and the water in it under pressure, there will be a spring at the "stream-bed."

A spring would naturally be looked for in the sluit at E, as it is the lowest part of its valley; but it may happen that the stratum *b* does not outcrop at a higher point, and consequently receives no rain.

I would now direct your attention to the deep-seated springs produced by "faults," fissures, and curvature of the strata and trap dykes.

Fig. 8 shows the effect of a "fault" which traverses different kinds of rocks, bringing down the strata on the left, so that the continuity of the sandstone bed is interrupted; in fact its end is faulted against the impermeable layer B. The rain water sinks into A, at its outcrop, on the left, and flows along it until it is stopped by the "fault," when, if there is no side outlet into a sluit or cliff, the water accumulates until it rises high enough to cause a spring.

Springs are often the only index to "faults" of this nature, for the line is usually hidden by superficial accumulations.

Fig. 8.

Fig. 9 is an example of a fault cutting off the supply which the nature of the country would lead us to expect at S, supposing there were at the surface no indications of a fault. After heavy rains it may happen that a temporary spring will appear at S; the fault has not been filled up with impermeable material, but in general the main body of water passing through the sandstone will be drained off by the line of fracture, and will be thrown out at some point along its course where the fault runs out to the surface.

Fig. 9.

Fig. 10 shows a fault filled with impervious material wihch intercepts the water-bearing strata, producing a spring at S, more or less strong according to the area of the outcrop of the porous strata, and the quantity of rain which sinks into it. Should the height of the outcrop above S be insufficient to produce a spring, the water dammed up by the fault may still be utilized by sinking a well on the right side of the fault.

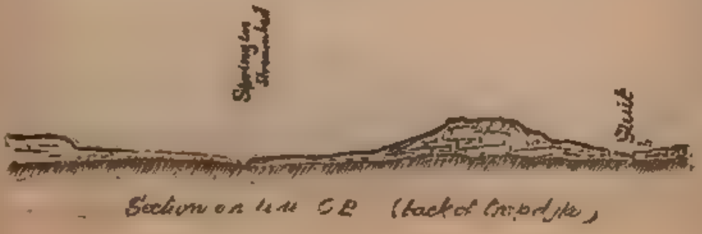
Fig. 10.

By far the greater number of the springs in this colony, but more especially in the Karoo districts, are produced by the occurrence of trap dykes, which, traversing tracts of country, act as natural dams, intercepting the flow of the underground water in the same ways as the "fault" shown in Fig. 8, so that it forms subterraneous reservoirs, the outlet of which is always at neks or openings cut by rivers through the ridges caused by the harder character of the trap.

Fig. 11.

It frequently happens that springs do not appear at the surface outlets of certain drainage areas where they cut through the trap dyke. This may be accounted for in two ways; either the trap dyke is fissured, thereby allowing passage for the water which would otherwise be impounded against it, or the water may run along the back of the dyke, under koppies and neks, to an outlet in a lower valley, as shown by the line *a b* on

Fig. 12.



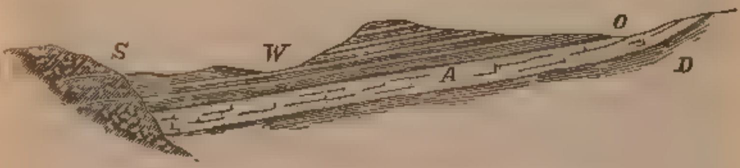
By lowering the dyke at *b* Fig. 11, or sinking a well, the flow could be intercepted.

Fig. 13.

Section at Spring perpendicular to OP

A form of artesian spring is shown in

Fig. 14.



The set of strata A rest on the impermeable rocks D, and are overlaid by another mass also impermeable. Should the quantity of rain which is absorbed at the outcrop at O be in excess of the capacity of the spring at S, the water will accumulate and cause the spring to act under pressure just like the flow from the top of a barrel.

Although what are generally called, "intermittent" springs, are more interesting from a scientific than from an agricultural point of view, it may be interesting to explain the conditions on which some of them act. In Fig. 15 B is a layer of sandstone with one layer of impermeable material above and another below. These form a basin, the lower side of the upper impermeable layer being considerably below the upper side of the under layer at the saddle. The rain which falls on the higher exposed edge will percolate into B until it fills up the hollow. So soon as the sandstone at the saddle gets saturated, the water will flow, on the same principle as that of a syphon, until it has drained the sandstone in the depression of all surplus water, when it will suddenly cease, and, probably, remain inactive until another continued rain.

Fig. 15.

Before leaving the subject of springs, I would refer to a common belief that springs are sometimes met with on the highest points of mountain ranges. An elementary knowledge of the elements of hydraulics is enough to show that such a thing is impossible. It is likely enough that, we may find a spring on the top of an isolated hill, but as its supply must come from a higher source, we shall without doubt find that, the rock in which the spring occurs, outcrops in some higher ground, and the strata of the two places are connected by a concave band in a similar manner to that shown in Fig. 15. I may also point out that great mistakes may be made in estimating the relative heights of mountains by the unaided eye. They should always be levelled by instruments.

Deep-seated wells may, generally speaking, be distinguished by their flows being uninfluenced by local rains, and by their temperatures, which are little affected by the seasons.

Wells and Borings.—The water hidden away in subterranean rocks, and which does not find an outlet by means of springs, can frequently be obtained, by sinking wells or bores in proper situations. Wells and bores are classed as shallow or deep. Shallow wells are sunk in the superficial accumulations, so generally found in basins and hollows, and in the upper strata, as in this colony.

If a well is sunk at W Fig. 4, until it reaches the saturated rock, water will percolate into it from the pores and fissures in the sides of the well, until it reaches a certain level dependent on the relation which the rate of infiltration bears to the rate which the water sinks away. It is seldom necessary to sink a well of this kind down to the clay, for whenever it is dug lower than the line of saturation water will stand in it. Of course, if the well be sunk down to the clay, or even below the level of the spring, it will yield a larger quantity of water, but at the expense of the spring. The depth to which it is necessary to sink wells, in superficial accumulations, is seldom uniform, for the gravels, &c., may have been accumulated at different times, by streams,

which have left tracks behind them, containing gravels and sands of variable capacities for the storage of water. Further, drifted gravels are always of a variable nature, some being extremely porous while others are quite the contrary. Again, the surface of the ground may be irregular, thereby producing irregularities in the line of saturation.

At the point W on Figs. 1, 4, and 15, surface or shallow wells might be dug with the prospect of obtaining a good supply.

Shallow wells are frequently sunk on the flats bounded by the concave curves of a river; in such cases they are supplied by the water filtering through the sand and gravels, which form the margin of the river or lake, as the case may be. With regard to such wells, Lyell states: "The facility with which water can percolate loose gravelly soil is clearly illustrated by the effect of the tides in the Thames between Richmond and London. The river, in this part of its course, flows through a bed of gravel overlying clay, and the porous substratum is alternately saturated by the water of the Thames as the tide rises, and then drained again to the distance of several feet from the banks when the tide falls, so that the wells in this tract regularly ebb and flow."

Surface wells are general throughout the colony, in fact, with a few exceptions, they comprise the only kind in existence. I regret to say that, in many instances better sites might have been selected, and much money and dissatisfaction saved by calling in a little engineering advice.

Burghersdorp, Robertson, the southern suburbs of Cape Town, and other towns are dependent on shallow wells for their drinking water. As may be expected, surface wells in the neighbourhood of towns are specially dangerous, owing to the contamination from noxious refuse, cesspools, and similar receptacles. That such contamination is abundant in the wells in the Cape Town suburbs, has been proved over and over again, by analysis as well as by the effect on the health of the inhabitants; but the apathy with which any scheme for improvement is received, seems to indicate a fear that pure drinking-water would, probably, produce an epidemic.

The part of the country likely to be benefited most by the sinking of shallow wells is the Karoo, where, in dry seasons, there is a dearth of surface water for stock and household purposes. Wells already sunk there seldom fail to obtain a supply, even when laid out in a somewhat haphazard manner. For example, between Victoria Road station and De Aar, wells have been sunk at every plate-

[illegible] strata, and water has always been found at depths varying from 25 to 40 feet.

The supply from surface wells is, however, of too uncertain a nature to be of any considerable value in irrigation.

It should be noted in connection with surface wells, that when first sunk, they always yield more water than afterwards, owing to the [illegible] being [illegible] before the well was sunk. Eventually, however, the yield becomes proportional to the rainfall. We should therefore not be [illegible] in sinking wells in one locality before the behaviour of the first has been determined; moreover, we should consider whether the sinking of a second well might not simply draw some of the water which previously found its way into the first, instead of tapping a new supply.

Deep-seated Wells.—The difference between shallow and deep-seated wells, consists rather in the distance of the outcrop of the water-bearing stratum from the well, and in the extent of the water-bearing area, than in the actual depths of the wells; for as will be seen by the Figs. 6, 7 and 8, wells sunk on the hills would require to be sunk to greater depths than wells sunk in the valleys; but, notwithstanding this fact, they would draw from the same water-bearing stratum. This is more clearly represented in Fig. 16, which, although representing an English series of strata, not met with in this colony, shows principles common to many deep-seated wells. V L is the lowest valley line of the district, below which the surface of the water cannot be lowered, by springs; the dotted line represents the normal plane of saturation, its position depending on the delivery of the springs at S and S. It is obvious that the most favourable positions for wells would be in the neighbourhood of the springs, where the line of saturation would be reached, and large supplies obtained from wells of inconsiderable depth.

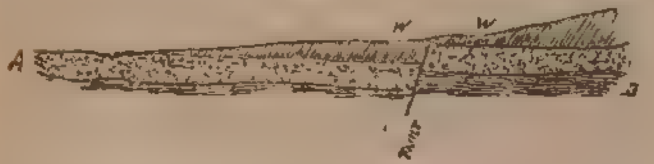
Fig. 16.

Supposing that at W in Figs. 4 and 16, wells were sunk, they would be mere drip wells until they penetrated below the line of saturation, and, compared with wells at S S, would involve the excavation of a much deeper well, without

tapping a fresh supply. In the case of a continued rain the wells at S S would be the first to fill, and positively run over, but until the whole of the water-bearing rock was saturated, the wells at W would not be full to the brim.

Fig. 17 represents a case in which the impermeable strata A has been to a certain extent "faulted" against the impermeable clay B, in such a manner as to leave a part of A in contact with itself. If there is no side outlet by means of the fault, water will accumulate until it finds an overflow into the permeable strata on the right. A well sunk at W would draw an abundant supply, but a similar well put down on the right would yield nothing. If the outcrop of A is at a sufficient elevation above the valley, and if the "fault" is filled with water-tight material, the water would rise in the well at W and overflow, forming what is known as an Artesian Well.

Fig. 17.



Reverting to Figs. 10 and 17, I may point out that, a well sunk at W would probably yield a large and permanent supply, but another sunk at W, although in many cases only a few yards distant, would not yield a drop. Mistakes of this kind, which are frequent throughout the colony, might have been avoided by the exercise of a little geological knowledge.

Artesian wells, or borings, as they are more frequently called, are only another kind of deep-seated well, the difference between an ordinary deep well and an artesian well being that the water-bearing strata in the latter kind are always overlaid by an impermeable bed, and receive their rain water at higher levels, so that when the water in them is tapped by a well, it always rises higher than when it was first found.

Fig. 18.

Fig. 18 illustrates the most simple conditions under which an artesian well can occur. The water in both layers percolates from the outcrops towards the centre of the basin, where, if the rainfall be abundant enough, and there is no outlet, it accumulates until its surface rises—in the case of *a*—to the level of the plain, and in the case of A considerably above it, possibly to such a extent as, sometimes, to overflow at the lower edge of the outcrop. If a boring is made at *w* until it reaches the porous stratum, the water will rise almost to the level of the plain, but if sunk to A it will rush up the bore and flow over.

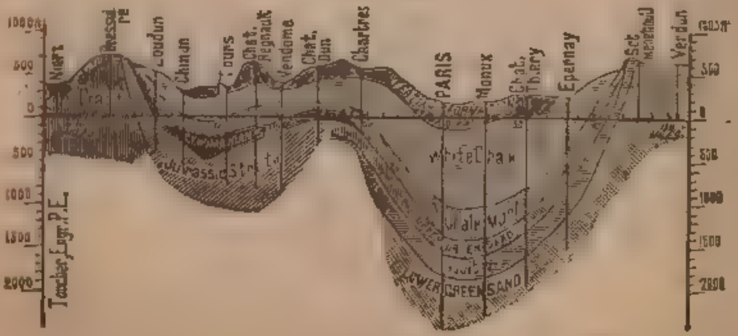
At first, the water not infrequently spouts high above the mouth of the well, but afterwards subsides and flows over quietly, in some cases even ceasing to flow at all. The first spouting is probably due to the liberation of gases, as in the case of opening a sodawater bottle, but subsequent subsidence is likely due to the lowering of the line of saturation.

Fig. 14, which I used to illustrate the cause of an artesian spring, may also serve the same purpose as regards a well. If there is no vent for the water at S, and if its outlet in other directions is barred, a bore sunk at W will give egress to the waters confined in A, which will rise to a height corresponding to the pressure where the bore enters the water-bearing stratum.

Many artesian borings have been sunk in the neighbourhood of Paris and London; some of those at the former place penetrating to a depth of over 1,800 feet.

Fig. 19 shows the conditions which exist in the Paris basin. The wells and borings have successively penetrated

Fig. 19.



a great mass of tertiary strata overlying the chalk, then the chalk itself, then the upper greensand, and the gault, and

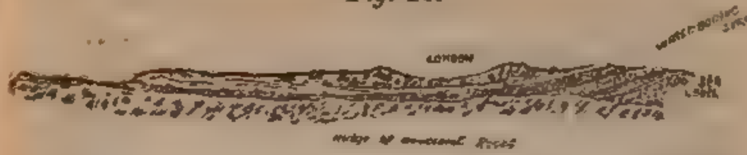
finally, have reached an abundant supply in the lower greensand.

Since the sinking of artesian wells in France, many others have been sunk in England, Germany, Algeria and other countries, where the geological conditions are favourable. As might be expected, success has not always attended the operations, but this has too often been due to insufficient examination of the country before deciding on the position of the well The failures have led to caution, as is evidenced by the preliminary surveys which are deemed necessary in Australia. In New South Wales, Parliament has voted money for testing the Great West and North West districts, for a deeper-seated and hoped-for supply; and it has been stated that, "should the predictions regarding the existence of such supply prove well-founded, and the water that may be discovered prove suitable for stock, or still further for irrigation purposes, it will be almost impossible to estimate the increased facilities that will be opened to settlement, or to assess the increased value of the territory." I read. the other day, that an abundant supply of fresh water had been obtained at a depth of 740 feet, at a place called East Maitland, but, whether this is a result of the investigations undertaken, I cannot say. In South Australia, stock routes have been opened up by means of excavating dams and sinking wells. One of the latter, sunk in the far north, is 1,220 feet deep—the deepest in any of the Australian Colonies. When found, the water gushed up 20 feet above the surface. This well has been bored in the cretaceous or chalk formation, which, in all countries where it is developed, yields an abundant water supply. Unfortunately for us, the formation is not developed in this colony. It is a fact worthy of remembrance in connection with underground water in this colony, that although water is said to be rather plentiful in many of the older rocks in Australia, it cannot be determined before sinking, whether the water is brackish or not. In North Africa, artesian wells have been wonderfully successful, so much so that as an American writer puts it, "those parts are beginning to bloom in waste places, in consequence of being watered by the precious liquid sought in the depths of the earth." In America no less than 21 yielding wells have been sunk in Chicago. One of them yields 900,000 gallons in 24 hours. Along the line of the Union Pacific Railway, wells have been sunk for supplying the necessities of the road; and in Nevada, a deep well is being sunk by the C. P. Railway Company, to determine the feasibility of obtaining water along the line, as well as in other parts of the State.

CAUSES OF FAILURE OF SPRINGS AND WELLS.—Experience shows that water may be obtained in abundance at one point in a stratum, while a few feet distant no water is obtainable in the same stratum. "Faults," fissures, and dykes, are the most frequent causes of success or failure in well-sinking, as I have pointed out when describing Figs. 8, 9, 10 and 17. Springs, sometimes, become weak or fail altogether, owing to the burning and cutting down of bush, as well as to the hardening produced by the continual movements of stock. Both circumstances tend to let the water run off readily, while, in addition, the absence of trees allows of a greater loss by evaporation. We frequently hear it asserted that, the rainfall is decreasing, but the rainfall returns do not confirm it. Probably, because, now-a-days, it is found that springs yield less than they once did; or because, now and then, they fail altogether, the change is put down to deficient rainfall. The explanation, however unpleasant it may be, is undoubtedly due to overstocking, and to the indiscriminate burning of bush. If we note the effect of pumping on a well, we can see the reason why the supply may diminish, after a time. As soon as the pumping begins, the water in the well descends until the influx into the well is equal to the draw, when it will remain stationary. To produce the influx into the well, the line of saturation around it must have an inclination sufficient to overcome the friction of the strata. Should the rate of pumping be in excess of the possible yield, the water-line may be lowered, and the area of the depression so extended, as to lower the water level in some of the surrounding wells. There are many cases on record, where continued pumping from a deep well has completely drained others in its vicinity.

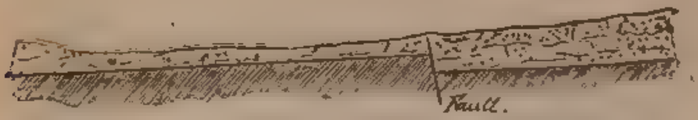
Overflowing wells were once common in parts of the Thames Valley, but they have now ceased to flow in consequence of the great number of wells, which have been sunk into the same stratum. The flow of the famous artesian well at Grenelle was seriously checked by the boring of another well at nearly two miles distant. These facts show that, underground water is by no means inexhaustible. That borings sometimes fail altogether is shown by one sunk recently in Spain, to a depth of about 3,340 feet, without finding water. Something similar happened in the London basin. The geology induced geologists to believe that beneath London the lower greensand would be reached at an inconsiderable depth, but numerous sinkings have proved that the continuity of the water-bearing strata is broken by ancient non-water-bearing rocks, as shown in

Fig. 20.



The configuration of a country may indicate a likelihood of obtaining well-water, but on sinking wells none will be found. In such cases an open "fault," not visible at the surface, may drain off the water to an outlet at a lower level.

Fig 21.



MEANS OF INCREASING UNDERGROUND WELLS.—The available water underground may be increased in arid countries, by the construction of collecting-dams on porous rocks, and by diverting streams of water, so that they flow over the outcropof a water-bearing stratum. In fact, everything which acts as an obstacle to the rapid flow of water from the drainage area increases the quantity of water which finds its way underground. For this reason, trees, bush and other vegetation, exercise an important function in detaining water, partly by their roots opening passages for the rain, partly by the evaporation which they prevent from the ground and from the pools in river-beds, and partly by the obstruction which they offer to the surface flow of the water. Among the artificial methods recommended for increasing the supply of underground water, is that of sinking intercepting pits, or wells, communicating with permeable strata, with the intention of leading water into them, to sink away, to be again obtained in wells or springs. This method might be very well, if rain-water was always free from silt; but it would be useless in this country, where the surface water, due to rains, is surcharged with fine silt.

As regards the increasing of the flow of a spring, the circumstances are so varied as to preclude a rule being followed. Great caution is necessary, because by increasing the flow we may drain the water stratum too quickly, and cause our spring to cease altogether in droughts. In arid countries it is more often the case than otherwise that, a spring yields the whole available supply, and that any

temporary increase may be at the expense of the permanency of the spring.

A spring may be increased, as in the case of Fig 13, by lowering the vent; but, first of all, we should examine the drainage area, in order to find out whether the existing discharge does not bear a fair proportion to the available rainfall.

It may as well be pointed out that, in many cases every additional gallon of water obtained from a given well is so much taken from another one.

When a well has been sunk in the neighbourhood of a "fault" or fissure containing water, without striking the water, a tunnel driven from the bottom of the shaft to the "fault" will overcome the difficulty.

At Brighton tunnels of this description driven in various directions in the chalk increased, to a great extent, the delivery from the well.

Blasting should never be resorted to for the purpose of lowering the point of outlet of a spring, for fissures will probably be produced sufficient to lead off all the water into the underlying rock.

An increase may be made to a well already executed, by boring or sinking, so as to cause a greater pressure in the surrounding rock, by lowering one end of the water-line. It should not be forgotten, however, that we may lose the water altogether, by sinking the bore down into a comparatively dry stratum, or at least a stratum capable of carrying off a large supply. For instance: suppose the well at W, Fig. 7, were found too feeble, and an attempt made to increase its yield, by sinking into the stratum *b*. If, as was assumed, in describing the section, *b* is devoid of water, owing to the non-exposure of its outcrop, the deepening of the well would result in the whole of its water being drained away by *b*. The artesian well W, Fig. 18, is another case in point. If the outcrop of A is covered by clay, enough water may not enter to fully saturate it, in which case, a bore sunk at W, as shown, would simply drain the upper water-bearing stratum into the lower.

CONCLUSION.—It is necessary for me to recapitulate, in detail, the special conditions which influence the occurrence of underground water, in this colony; and indicate, whether or not it is worth while searching for water in a given locality. I have already described them under the various heads of my lecture. Water at shallow depths may be found, in fair quantities for stock and farm-house supplies, throughout the greater part of the Karoo. There is no

mystery about the matter, as some of the votaries of the so-called "Water-finding" would try to make us believe; all that is necessary is a good local knowledge and a power of observation. When, however, we come to consider the prospects of obtaining a water supply at great depths, or even at moderate depths of say 50 to 100 feet, a knowledge of the conditions of the rainfall, the character of the strata, and the disturbances they have undergone, and of hydraulics, are absolutely essential. Even then there is always a degree of chance about the first well bored, but there are, generally, indications sufficiently clear to lead any practised geologist to say beforehand, whether any disturbance or "fault" exists likely to lead to failure.

The conditions of the rainfall in this colony are now beginning to be fairly well understood, thanks to the labours of Mr. Gamble, the Hydraulic Engineer to the colony, who, ten years ago, induced the Government to start a system of rainfall registration. From the returns obtained from various parts of the colony, Mr. Gamble has compiled the rainfall map and diagrams (exhibited at this lecture) which show the distribution of rainfall throughout the year, and the fluctuations to which it is subject from month to month.

While a good deal has been done to determine the conditions of the rainfall, very little information is possessed concerning the history of that portion which sinks into the earth. All we know is that, at shallow depths all over the Karoo and other plains, throughout the colony, water exists in sufficient quantities for stock and the scanty population at present in existence. That it exists in large quantities, at great depths, will not be proved, until our legislators do as those of Australia have done, viz., institute an examination of the country for the purpose of determining the nature and mode of occurrence, and the water-bearing capacities of the rocks, and vote money to carry on the examination.

So far as we know, the prospects of finding large quantities of water, especially under pressure, are not very favourable, as may be inferred from a study of the rainfall and the inclination of the strata, as shown in Figs. 6 and 7; yet, as there are cases in which artesian supplies have been obtained, it would be well to determine, once for all, what are the capabilities of the arid districts of the colony. If farmers would carefully gauge the springs on their farms, from week to week, they would do much towards elucidating the problem of what proportion the spring bears to the drainage area from which it is supplied.

To conclude. In the words of Dr. Evans, F.R.S., "It cannot be too often repeated that, every gallon of water pumped and carried away from an absorbent district, is so much abstracted from the flow of the stream in the districts. The streams being merely the overflow from the subterranean reservoirs, it is evident that any artificial diminution of the water in the reservoir must, *pro tanto*, affect the streams; and even in those districts where the district is towards the sea, that discharge will be diminished in a similar manner. I have heard people speak of vast and inexhaustible stores of water, which have been laid up in the body of the earth for untold ages, and which have merely to be tapped to meet all the necessities of a crowded population, and I have heard others speak of springs as if there were some spontaneous process in nature by which water was produced in unlimited quantities. But all here will readily acknowledge that the water that is upon the earth beneath, and the water that is under the earth, derives its existence from no other source than from the heavens above."

XIII.

DIAMONDS AND THE DIAMOND FIELDS.

By Mr. Justice Laurence, LL.D., *Kimberley, Griqualand West.*

PART I.

The subject of the lecture which I am about to deliver is "Diamonds and the Diamond Fields of South Africa;" and I feel that for me to propose to deliver a lecture on such a subject is a proceeding which requires a preliminary apology, at all events in the classical sense of that word. Permit me briefly to explain how the thing came about. Some time since the committee which was appointed here to organise a series of lectures in connection with this great Exhibition of yours—on the signal success of which allow me to offer you my hearty congratulations—communicated with the Kimberley committee, and inquired whether we could recommend any gentleman who would be prepared, during the Exhibition, to give you a lecture illustrative of the exhibits from the Diamond Fields. We felt that the idea of a course of lectures was an admirable one, and that it was very desirable that the subject of the Diamond Fields should be included in the course; and we accordingly recommended your committee to apply to Mr. Theodore Reunert, an engineer of standing on the Fields, a gentleman who combines great technical knowledge with considerable literary ability, and who has been requested by the Central Committee to prepare a pamphlet on the diamond mining industry, in connection with the London Exhibition of next year. I had quite hoped that Mr. Reunert would have been able to come down, in which case I feel certain he would have given you a far more interesting and instructive lecture than, with my limited knowledge and the very limited time at my disposal, I could possibly hope to prepare. Mr. Reunert's engagements have unfortunately prevented him from visiting Port Elizabeth, and it then occurred to me that, rather than leave the great industry of the Diamond Fields totally unrepresented in your course of lectures, I might attempt, so to speak, to act the part of a

stop-gap, and endeavour, in that capacity, to offer you a few observations on the subject. I do not know whether you have ever heard the story of the gentleman who was once invited to give a lecture, and was left to select his own subject. In these circumstances he applied to an experienced friend for advice. His friend's advice was, "Choose a subject of which you are profoundly ignorant;" and on being asked his reason, he explained that it would be very useful to the lecturer, as he would be compelled to get up the subject, and thus increase his stock of knowledge. On this principle you ought to have had a lecture, say, from Mr. De Smidt, on Viticulture, and from Baron von Babo, on Art; but I must say that the principle strikes me as one the application of which is likely in most cases to prove more beneficial to the lecturer than to his audience.

Now the subject of my address to-day is one on which it would be affectation for me to profess myself altogether devoid of previous knowledge; for it is impossible to live for five years on the Diamond Fields, constantly occupied in Court, whether at the bar or on the bench, with complicated mining cases, and taking an interest in the conditions and the problems of that industry which is to the constitution of Griqualand West the very life-blood in the veins, without acquiring, in one way or another, a considerable acquaintance with those problems and those conditions.

I have not, however, felt justified in relying solely on knowledge thus fortuitously acquired; and I wish, before proceeding further, to acknowledge my special indebtedness to Mr. Reunert, for a great deal of valuable information which he has kindly placed at my disposal; to a pamphlet containing some valuable reports on the Diamond Mines of the Cape by Mr. J. B. Finlason, formerly Chief Inspector of Mines and Chairman of the Diggers' Committee, and by Mr. F. W. North, F.G.S.; to a paper on the Diamond Fields read before the Institute of Civil Engineers by Mr. Paxman; to the article on Diamonds in the new edition of the Encyclopædia Britannica; and to various official reports and returns which it is unnecessary to specify in detail. The main difficulty indeed which I have encountered has been not in obtaining but in selecting information, and in deciding which, out of a host of topics which present themselves to the mind and claim the attention, could be most profitably selected for handling within the narrow limits of a lecture.

What I purpose to do, with your approval, is, after a few introductory remarks on diamonds in general, to give you a brief sketch of the past history and present conditions,

adding, perhaps, a few words as to the future prospects of the diamond industry in South Africa.

Now, as to diamonds in general,—the first subject of inquiry which presents itself is, Where do we first find the diamond mentioned? The answer takes us back to a very early period in the history of the world—to the 39th chapter of the Book of Exodus. In the description of the breast-plate which was fashioned for the high priest, Aaron, we are told that "they set it in four rows of stones"; each row contained three stones; and the second row contained "an emerald, a sapphire and a diamond."

Now, in these days of historical criticism, what with the scientific researches of men like Huxley and Darwin, and the literary researches of men like the late lamented Bishop Colenso, and the learned labours of those divines and scholars who have lately prepared a revised version of the Scriptures, every statement has to meet the challenge of historical inquiry; and a difficulty undoubtedly has arisen about the diamond, which is said to have been the last stone in the second row of the breast-plate of the high priest, Aaron. For, we are told in one of the following verses, that "the stones were according to the names of the children of Israel, twelve, according to their names, like the engravings of a signet, every one with his name, according to the twelve tribes."

Now, it is at once pointed out that, as there is no reason to believe that any method of polishing such hard stones, still less of engraving letters on them, was known at the period of the wanderings of the children of Israel in the wilderness, the identification of the Hebrew *jahalom* with what is known to us as the diamond, cannot be accurate. However this may be, we find the stone mentioned among the ancient Greeks as early as the third century before the Christian era. By them it was known as the *adamas*, or the "unsubduable," owing to its hardness and power of resisting fire; and from *adamas* the modern word "diamond" or "diamant" is derived. The fullest account of the *adamas*, as a stone, is found in the Natural History of Pliny, a work combining much acute scientific observation with a curious admixture of superstition. Pliny describes it as exceeding in value all human things, as being, what Æschylus describes horses as being, αγαλμα ὑπερπλούτου χλιδῆς, an ornament of the exceedingly rich and luxurious, possessed only by kings, and by very few of them.

You may perhaps have heard a story of Sir Robert Walpole—the corrupt minister of a corrupt age—who often

found it necessary in his political schemes to avail himself of feminine influence, and who says that of all the ladies whose aid he sought to enlist, he found only one who would not take gold, provided there was enough of it—and she took diamonds! The Roman ladies of the Empire were as eager as the English ladies of the eighteenth century to secure the precious gem—some scandalous stories of their cupidity are related by the satirists of the period—though of course in their time only stones with naturally polished faces could be used; and in fact many specimens of "rough or uncut diamonds," to use the phraseology of our Diamond Trade Acts, set in gold, and with no artificial polishing, have come down to us both from classical and mediæval times. Owing to its unworkable character, the use and value of the diamond necessarily remained greatly limited; and rubies and other precious stones were in consequence often preferred before it.

It was just about four centuries ago, in 1476, that Ludwig van Berghem, of Bruges, first discovered the art of cutting and polishing diamonds, by a method which has passed in the phrase "diamond cut diamond" into a proverbial allocution. Some indeed assert that this discovery was made by some jewellers of Nuremburg, at a slightly earlier date; but the evidence in support of this claim appears to be somewhat weak.

It was in the following century that the use of the diamond for cutting glass and engraving other gems appears to have been discovered. The art of cutting diamonds, polishing the surface and forming facets by means of diamond powder, was one in which the artificers of Holland long retained a pre-eminence almost amounting to a monopoly; but in recent years the trade has been greatly developed in England, where many of the finest stones are now cut.

The process is one which requires not only great technical skill, but the expenditure of much time and labour. To cut a stone of 25 to 30 carats, used, formerly, to require some seven or eight months of constant work. In the case of the celebrated Pitt diamond—a stone which has had a most remarkable history—it took two years in cutting. It is considered the finest and most perfect brilliant in Europe. It was sold to Louis XV. of France for 2½ millions of francs, or £100,000, though it is now valued at twice that sum; it adorned the hilt of the sword of State of the first Napoleon; and—not the least singular incident in its history—like the famous "Chapeau de Paille" of Rubens, it once narrowly

escaped seizure as a heriot, its owner happening, at the time of his death, to have some fragments of copyhold in his estate. It now weighs 136 carats, but in the rough it weighed 410, and the fragments split or sawn off in the process of cutting were valued at several thousand pounds.

The time required for cutting has, however, in recent years been greatly reduced by the employment of machinery driven by steam; and those of you who are contemplating a visit to England this year, will be glad to learn that arrangements are being made for all the processes of diamond cutting to be practically illustrated, in connection with the display of diamonds from the Cape, at the Colonial and Indian Exhibition, which is to be opened next May.

More than two hundred years after the discovery by Ludwig van Berghem, another discovery, as important scientifically, as his was practically, was made. I refer to the proof of the combustibility of the diamond, and the knowledge which was thus obtained of its chemical character and composition. In the years 1694 and 1695, the combustibility of the diamond was confirmed by experiments made with a powerful burning-glass or lens, in the presence of Cosmo III., Grand Duke of Tuscany, by the Florentine academicians. Similar experiments were afterwards successfully repeated in the presence of the Emperor of Austria. It was Lavoisier who finally demonstrated that the product was carbonic acid gas, and that the diamond was simply pure carbon in a crystallized condition. Various experiments have been made as to the action of heat on diamonds, and it has been shewn that when air is excluded and the diamond exposed to a temperature at which pig-iron melts, it undergoes no change; but at a higher temperature, like that at which bar-iron melts, the diamond, while retaining its form, begins to be converted into graphite. It may, however, be observed, from a popular point of view, that in the insurance of diamonds the risk of destruction by fire may practically be ignored—a fact which was illustrated the other day on the Diamond Fields, when a house was burnt down, with some regrettable loss of life, and some fine diamonds—which, I also regret to say, the inhabitants had no right to possess—were found intact among the ruins.

Although the chemical composition of the diamond has thus been ascertained, its origin, whether vegetable or mineral, is a point still not finally determined. Most scientific men have assigned to it, like amber, a vegetable source; but it is a remarkable fact that the diamond when consumed by heat leaves, according to the better opinion,

S 2

no ash behind; and the discovery of diamonds in the neighbourhood of igneous rocks, as at the Cape, "has tended to favour the view that it owes its origin to heat or metamorphic action, as is the case with graphite." (Encyclopædia Britannica.)

I may here mention that there is little room for doubt that the diamond, as discovered in the mines of Griqualand West, owes its present position to volcanic action, and to upheaval from a lower stratum. The mines may be described as basins, or perhaps more correctly, as funnels; and as to that part of the Kimberley exhibit which I dare say has attracted your attention, I mean the so-called "diamonds in the matrix," you may, perhaps, be surprised to learn that there is every reason to believe that the "blue" ground in which diamonds are now found is not the true matrix, or mother rock in which they were originally formed. One proof of this is found in the fact, as mentioned by Mr. North, in an interesting paper on the Kimberley Mine, read in England, before a local institute of mining engineers, "that some of the diamonds now found in this matrix are broken pieces of larger ones, and as no signs of the pieces ever occur they could not have been formed at the exact spot where they now rest, because the detached pieces are never near them. Mingled also with this peculiar matrix are boulder stones of igneous rock from 1 to 15 feet diameter, and other deposits quite foreign to the matrix itself. During the excavation, immense and peculiarly shaped masses something like undulating sheets of rock, containing no diamonds, have been traced for two or three acres of the mine, and this has acquired the name of 'floating reef' from the diggers; for all ground being different from the diamondiferous earth, whether it be the walls, or sides of the crater, or floating masses of rock mingled with the matrix, has been called by them and is now known by the name of reef." The formation of the so-called "floating reef" is well illustrated by the sections of the various mines, and particularly that of De Beer's, which have been prepared for this Exhibition. The word "reef," a word which to the searcher for gold spells "eureka," to the searcher for diamonds, on the contrary, in all its aspects and all its significations, spells misfortune and difficulty, in some cases disaster and despair. But of course the so-called "floating reef" mentioned by Mr. North must not be confounded with the "main reef," which is nothing but stratified shale, highly friable, and liable to crumble away when exposed to the action of the

air. This reef, the arch enemy of the digger, upon which I may have a word or two to say presently, contains no diamonds, and forms the outer edge of the basins or funnels filled with diamondiferous ground of which the mines consist. I may here add, with regard to what I have said as to this soil not being the true matrix, that additional testimony to this fact is furnished by the circumstance that in some cases, as the depth of working increases, the finds are said to increase in quantity.

Some of the claims are cut out by the main reef at a certain depth, and the superficial area of blue ground, on the whole, tends to diminish; but experiments which have been made by sinking drills, and other means, show that there is no present prospect of the Kimberley digger coming to what, I believe, is termed by diggers, a "pan out." It may be that, as the depth increases, all the resources of engineering skill will be taxed to the uttermost, in order to enable mining to be prosecuted with profit; but as to the exhaustion of the supply of diamondiferous ground, that is certainly a possibility which may be relegated to the dim and distant future; and to prevent misconception I may perhaps explain that by "the dim and distant future" I do not mean, what Lord Salisbury says the phrase means when used by Mr. Gladstone, that is to say, the space of just two years and a half.

One word may, perhaps, be added fitly here, connected as the subject is with what I have said of the chemical properties of the diamond, and connected also with the possible dangers to which I have somewhat discursively alluded as threatening the future successful prosecution of the diamond mining industry. In the article on "Diamonds" in the Encyclopædia Britannica, to which I am indebted, as already stated, for several of the facts I have mentioned, it is alleged that "all attempts to produce diamonds artificially have hitherto failed." Now, that volume of the Encyclopædia was published more than eight years ago, in 1877; and I believe at that time the statement of the writer was absolutely correct. Several scientific men, whose attention had been engaged by this fascinating problem, had indeed at various times claimed to have succeeded in producing artificial diamonds; but their claims had in all cases failed to stand the tests to which they were subjected. The chemists had indeed succeeded in changing the colour of the diamond—changing, for instance, a brown stone into a rose colour—but even this change of colour did not prove permanent; while as to artificial production, though the

problem, as stated on paper, did not appear incapable of solution, in practice they were entirely to seek. A series of experiments, however, was made two or three years ago by a French chemist, a M. Despretz, in the artificial crystallization of carbon, which proved not entirely infructuous. By means of slow volatilization in an inductive current, he did succeed, in the year 1853, in obtaining what appear undoubtedly to have been microscopical diamonds. That is to say, he obtained, I do not know at what expense of time and labour and skill, crystallized carbon dust, which proved capable of cutting rubies. I have not heard that M. Despretz or anyone else—for there have been many other workers in the same field, and I have not the slightest doubt that the diamond digger or the holder of shares in diamond mining companies would be delighted if he could obtain a perpetual interdict against the whole tribe—I have not heard that these gentlemen have obtained any further or greater success with their experiments. It is said that if carbon could be artificially crystallized on a large scale, the result would be a great boon to science, as it would then be possible to use diamonds as lenses in telescopes and microscopes, and their magnifying power would be enormously enhanced; but such, I fear, is the selfishness of human nature, such is the lack of sympathy with scientific achievements and progress on the part of the South African colonist, that we should all prefer to content ourselves with the facilities at present afforded for the observation of the wonders of the heavens and those infinitesimal but deeply interesting works of nature which the microscope reveals, rather than see imperilled by scientific researches an industry which at present produces—though I trust your farmers will not allow it long to remain so—the most valuable of the commodities which South Africa supplies to the civilized world, and of which the exports (including diamonds illicitly exported) probably do not fall below an average value of three millions sterling per annum. Let us be content with our present microscopes, and trust that the diamond dust of M. Despretz will continue to be microscopical. I may add that crystallized boart has also been artificially produced, but only of very minute size. It is of no value except for cutting, for which purpose it is inferior to diamond dust.

All things marvellous come from the East; and the oldest and for long the only source of diamonds was India. They have been found in various parts of that country, in the Deccan and in the presidency of Madras. You have all heard of the mines of Golconda. Golconda is in Madras;

but it may be a shock to you to learn that Golconda is not a mine at all. It was merely a fortress where diamonds were collected and stored. The Indian diamonds were all found in recent deposits, in many cases in alluvial soil, probably never in the original matrix; and the workings, though not entirely abandoned, have long ceased to have any commercial importance. There has also been for some time a small export of diamonds from the island of Borneo, averaging, I believe, about 8,000 carats per annum; but during the latter part of the last and of the first half of the present century the supply of diamonds came principally from Brazil. They were first discovered there in the year 1727. It is said that they had long been used by the natives as counters in playing cards. The mines belong to the Government, and are worked by slaves—or at all events, were until quite recently, when, I believe, the slaves were emancipated, though I am not quite certain whether the process of emancipation, which was intended to be a gradual process, is yet complete—who reside in barracks, which, according to the descriptions I have read of them must in many respects resemble the compounds for native labourers which, I am glad to say, for the sake of both the natives themselves and their employers, are now being extensively introduced at Kimberley, thus greatly diminishing the facilities both for disposing of stolen diamonds and obtaining poisonous brandy, which have had such lamentable effects on the health and the morality of the Kafir labourers employed on the Diamond Fields. It is said, however, that, notwithstanding all the precautions taken, the Brazilian Government loses many diamonds through theft. The mines originally belonged to private owners, when the supervision was less strict, and the depredations still more extensive. Some interesting observations on this subject were made by Mr. Kitto (a mining engineer, who resided for some time at Kimberley), in a report addressed by him to Colonel, now Sir Charles, Warren, in 1879. I cannot say that I have found Mr. Kitto a very trustworthy authority on matters connected with the diamond industry in Griqualand West; but his observations, based on personal experience of Brazil, may perhaps deserve quotation, if only as furnishing evidence that the diamond industry, owing to the peculiarities of its subject matter—its immense value, its smallness and portability and the difficulty of identification—is an industry which, all the world over, demands and is entitled to receive, as it has received in this colony, special measures for its protection. "In dealing with the diamond question,"

he says, "the Government had a difficult task to perform; the owners acknowledged that they could no longer make the mines pay, owing to the large quantities of diamonds that were stolen, and yet, so exciting was the industry, that they tried all in their power to prevent the Government from taking them over. Some unprincipled villains tried to induce the negroes to revolt, and were deservedly executed. The royal fifth was not sufficient to meet one quarter of the expenses incurred in maintaining order through the country, petitions were sent to Portugal against the local government, but to no effect. The Government took over the whole of the diamond mines, allowing the owners a small sum for any improvements they had made. They at once declared a district about 50 miles long by about 30 wide to be a diamond district, into which no person could enter without a passport or leave without getting it endorsed. Sites for towns for white people were laid out in the most conspicuous places, and negroes were taken proper care of. Mounted soldiers were placed at intervals in convenient places on the boundary of the province, who had power to search any person passing over the border, much in the same manner as if your Excellency were to place a kind of mounted police at the fordable parts of the Orange River for the purpose of searching all persons who pass over, and sending them back again if they cannot shew a Government authority for carrying the diamonds in their possession over the border. The Government soon made the diamond fields a success, and carried out such a rigorous policy that it eventually became too hot for thieves, and consequently an industry, that was well nigh crippled in its infancy, has been a source of wealth for about 160 years."

Mr. Kitto, in the passage I have quoted, has drawn a picture of what might be done in South Africa in the way of protecting the diamond trade and searching persons suspected of being in illicit possession of diamonds, which, when he addressed his report to Col. Warren some six years ago, he evidently flattered himself was rather a brilliant effort of the imagination; but we know that a good deal of what he thus suggested as a fancy picture has since then been practically carried out. Whether in any other respect the future history of the diamond industry in South Africa is destined to resemble the past history of the diamond industry in Brazil is a question which it may be not uninteresting to ask, but which the future alone can solve.

Mr. Kitto also states that the diamonds of Brazil have been a source of wealth for 160 years; but it is only right

to observe that they have not been a very considerable source of wealth. Statistics on the subject are somewhat meagre, but it has been estimated that in the 46 years ending in 1818, diamonds of the aggregate weight of 3,000,000 carats, or about equal to one year's export from South Africa, and valued at about £7,000,000, were exported. The total value, in the seven years 1861-67, has been given at about £1,900,000; and since the discovery of the South African Diamond Fields, both the quantity and the value of the Brazilian export has been further reduced. When first brought to Europe the Brazilian diamonds were pronounced inferior to those of India, but apparently with little or no reason. Similarly the Cape stones have been regarded as inferior to those of Brazil; and as a rule they are no doubt not equal to them in colour.

Pure brilliants, however, are not infrequently found, especially in the Jagersfontein Mine in the Orange Free State, at the River diggings, and in the Du Toit's Pan Mine, in Griqualand West. The Bultfontein stones, though not equal in value to those of Jagersfontein and Du Toit's Pan, and usually of small size, are also as a rule of good colour. In Kimberley and De Beer's the stones, as a rule, are what is known as "off-coloured," that is, tinged with yellow; but many fine white stones have been found in the Kimberley Mine, particularly on the west side, where the principal claims at present worked are those of Mr. W. A. Hall, and one of the most perfect brilliants ever unearthed, the well known Porter Rhodes stone, valued by the owner at £100,000, was found in the centre of the Kimberley Mine, in a claim now belonging to the Central Company. The colour in the Cape diamonds—which often, to a great extent, disappears in cutting—is attributed to the presence of foreign matter as distinguished from pure carbon, a fact which is proved by their greater density and also by their being more combustible, containing as they do oxygen in proportion to the density of colour.

I am informed that about one quarter of the diamonds exported from Brazil are pure white, the rest being of varied colours. In this matter, however, there is reason to believe that the produce of the Cape has greatly suffered in repute from an artificial system of classification. If a pure brilliant comes into the European market, whether from South Africa or South America, probably, judging from the amount of the respective exports, in nine cases out of ten from the former, it is at once labelled, and designated, and sold, as "Brazilian," thereby fetching a higher price; while all the

coloured stones, wherever they come from, are classed and denominated as "Cape;" and thus does the repute of the Diamond Fields of this colony suffer from the caprice of fashion, the trade value of a name and the artifices of the wily denizens of Hatton Garden. It is to be hoped, however, that the classified collection of Cape stones, which is being prepared for the Colonial and Indian Exhibition, will go far towards correcting this misconception.

The Cape, however, even if bound to admit some real, and much more reputed, inferiority in quality to the produce of Brazil, can boast of an enormous superiority in respect not only to number but also to size. The Brazilian stones are mostly very small, averaging about one carat, and rarely exceeding 5 carats. In 1854 a diamond of brilliant lustre, and weighing 254 carats, was found in Brazil, but this was quite unique. When cut it weighed 124 carats, and is known as "The Star of the South" In fact, before the discovery of the South African Diamond Fields, where stones of very considerable size are constantly being found, the number of large diamonds known to be in existence was far from great. I will not detain you by more than a bare mention of one or two of the most famous. One of the most celebrated is the Orloff, in the sceptre of the Emperor of Russia, weighing 194 carats, and said to have been stolen from the eye of an Indian idol, by a French deserter. It found its way to Amsterdam, and in 1772 was sold to Count Orloff on behalf of the Empress Catherine for 450,000 roubles, an annuity of 4,000 roubles, and a title of Russian nobility. The Pitt diamond I have already mentioned. Another famous stone is the Kohinoor, which was presented to the Queen of England on the annexation of the Punjab to British India in 1849. This stone has a marvellous legendary history, with which I dare say some of you are familiar, and on which I have no time to dwell. By some it is supposed that both the Kohinoor and the Russian Orloff are portions of one original stone, formerly belonging to the Great Mogul. The Kohinoor was shewn at the first Exhibition of 1851, and then weighed 186 carats. It has since been recut, in the rose shape, not, it is said, to its advantage, and now weighs only 106 carats, a size which I fancy will be exceeded by several Cape diamonds which will be exhibited in London next May. But the greatest of all known diamonds, if it be a diamond, is the Braganza, which forms part of the regalia of the royal house of Portugal. The Braganza is said to weigh some 1,500 carats; but is it a diamond at all? Its very size creates grave suspicion;

and it is somewhat significant that no test of its character has ever been allowed. On the whole the Braganza cannot safely be included in the list of genuine diamonds.

Besides Brazil and the Cape there are at present no known diamond fields of any importance. You may perhaps have heard something about diamonds having been discovered in Australia, and I daresay you did not regard the rumour as altogether an agreeable one. You are sorely pressed by Australian competition, as well that of South America, in the matter of wool; and you would probably not be over-pleased if you heard that Australia had united her forces to those of South America in competing with you in supplying the civilized world with diamonds. As far as I can ascertain, this is a competition about which there is no very material ground for apprehension. Undoubtedly diamonds have been found in Australia, principally at Bingera; but the quantity is not great, and they are all exceedingly small. I have a note with regard to Bingera to the effect that somewhat extensive machinery was recently erected there, that 279 loads of wash-dirt were washed, with a yield of 920 diamonds, of the aggregate weight of $197\frac{3}{4}$ carats, or an average weight of about one-fifth carat. The scarcity of water was the greatest drawback at these diggings, and the results up to the present may be described as insignificant.* Diamonds were first found in Australia as early as 1852; and I cannot help thinking that, if there were any really valuable mines in the country, the energy and enterprise and mining experience of our Australian fellow colonists would have discovered them long ago.

PART II.

SOME eighteen years ago, at the Paris Exhibition of 1867, among the exhibits from the Cape—not on the whole a particularly magnificent collection, either in quantity or quality—there was probably none which attracted greater attention than the first fruits of the South African Diamond Fields, a stone weighing about twenty carats, exhibited by Sir Philip Wodehouse, then Governor of the Colony. The story of the discovery of this diamond has been so often told that a passing word will here suffice. Just as diamonds in Brazil were first used as counters by negro card-players, so

* *Engineering*, Feb. 20, 1885.

in South Africa the first diamond was observed as a plaything in the hands of the children of a Dutch farmer in the district of Hope Town. The farmer's wife made a present of the "pretty pebble" to another farmer, Schalk van Niekerk, from whom it passed into the hands of a trader named O'Reilly, and it was eventually forwarded to Dr. Atherstone, of Graham's Town, who pronounced it to be a diamond. A good deal of scepticism was exhibited in some quarters, and the means of testing were not immediately available, but in the end the fact that Dr. Atherstone was right was established beyond a doubt, and the stone was purchased by Sir Philip Wodehouse. It was not till two years later that "The Star of South Africa" dawned on the horizon. This famous gem, weighing over eighty carats, was originally offered for sale to a storekeeper by a Hottentot; it is said to have been once used as a charm by a witch doctor. After changing hands several times it was purchased by Messrs. Lilienfeld, of Hope Town, for £10,500, and in the end, after being cut, it was sold by Messrs. Hunt & Roskell to the late Lord Dudley, who, I believe, gave £25,000 for it. Models of both these stones, kindly lent by Dr. Atherstone, may be seen in the Kimberley collection at the Exhibition.

The news of these remarkable finds soon attracted attention both throughout South Africa and beyond its borders. Diggers from all quarters, Englishmen and Dutchmen, Frenchmen and Germans, miners from Australia, and miners from America, hurried to explore the new Eldorado, all eager to acquire, by the labour of a moment, wealth beyond the dreams of avarice. Finding little to repay their efforts in the neighbourhood of Hope Town, they proceeded along the banks of the Orange River and then of the Vaal River, till they arrived at a place known to them by the name of Klip Drift, now called Barkly West, in the neighbourhood of which diamonds were found, and still continue to be found, along the banks of the river, and which remained for some time the centre of the digging community. In the Barkly district numerous river diggings were opened up, the most important, given in the order in which they lie along the banks of the river, being Hebron, Pniel, Gong-Gong, Waldek's Plant, Keiskamma, Niekerk's Rush and Delport's Hope.

Some of these river diggings are still worked with fair success, the returns supplied by the Protection Board showing that between September, 1882, when the Diamond Trade Act was proclaimed, and March, 1885, diamonds were imported thence into the Kimberley district of the

aggregate weight of over 45,000 carats, and valued at £112,000. This gives a value of as nearly as possible 50s. per carat—a carat is slightly over 3 gr. Troy weight—or very much higher than the average value of stones found in the dry diggings; those from the river, though comparatively few in number, having always been remarkable for their superior quality. Besides the river diggings, four dry diggings have been in recent years opened in the Barkly district, namely, Victoria Kopje, Borrel's Kopje, Wrigley's Kopje and Newlands. As far as I am aware, the latter, the property of Mr. George Paton, is the only dry diggings in the district where diamonds, beyond those declared by the proprietors in accordance with the requirements of the law, have been actually found; and some specimens from the Newlands diggings, which are at present being worked on leases, are now exhibited at Port Elizabeth.

The early diggers at the River pursued their occupation with varying success; the labour was very great, the expenses, owing to the necessity of employing carts, oxen and native servants, very considerable; the finds were extremely uncertain; and some of the "pockets," or patches of diamondiferous ground, first discovered were quickly worked out. Of course, every now and then, the river digger had a big slice of luck, which encouraged him to persevere; and in 1872 Mr. Spalding's great diamond of 288 carats was found at one of the smaller diggings on the River. But in the year 1870 a rumour reached the camps on the Vaal that diamonds had been found some 25 miles off at a place called Du Toit's Pan, and thither a "rush" was quickly made. The farm of Dorstfontein, on which Du Toit's Pan was situated, was then owned by one Van Wyk. One day his shepherd brought him a diamond which he had found on the veldt. He invited some of his relations and friends to come and prospect his farm, and more diamonds were found. But this is a kind of good fortune which a man cannot long keep for the exclusive benefit of himself, his friends and his relations. The diggers from the River hurried up in their thousands, the farm was rushed, Van Wyk had to yield to the force of circumstances and issue licences to dig. Soon after he sold his farm, for the sum of £5,000, to the London and South African Exploration Company, who about the same time acquired the neighbouring farm of Bultfontein. The revenue which the Company has derived from this fortunate purchase has been something enormous. In one year it exceeded £100,000, it is now about £60,000 per annum, and the original £10 shares have changed hands for

£400. On Bultfontein, as on Dorstfontein, a mine was discovered, the homestead having been erected in the middle of it, and one or two diamonds being actually found in the mud plaster of the walls. After considerable litigation it was decided that the titles to these farms, being Free State grants, contained no reservation of minerals in favour of the Crown: and they were thrown open by the proprietors to the diggers on the payment of a monthly licence, which was ultimately fixed at 30s. for each claim of 900 square feet, with one acre of depositing ground attached.

The River diggings were now nearly abandoned for the superior riches of these two mines; a population of some 10,000 settled in the neighbourhood, living mostly under canvas, and digging with great energy, but encompassed by difficulties of every kind and employing methods of the crudest description. Early in 1871 another mine was discovered at a short distance from Du Toit's Pan. It was situated on the farm Vooruitzigt and occupied by a farmer named De Beer whence the mine, first prospected by a party of diggers from Natal, received its name of Old De Beer's. Each digger in this and the other mines was entitled, on paying the licence money, to two claims; if he ceased to work his claim for eight days, it was liable to be "jumped," or occupied, by the first comer. The method of working, as I have said, was at first extremely crude. The miner would dig the ground out of one of his claims, pass it through a series of sieves, and then sort the residue with a piece of iron hooping. Debris, of course, rapidly accumulated, and was deposited on the second claim. After a while, if the finds fell off, or the accumulation of debris interfered with further working, the digger would fill in the first claim with what he had excavated, and begin working the second. All these accumulations had afterwards, when better methods were introduced, to be cleared off at great expense; and when washing superseded dry-sorting the ground discarded as rubbish by the original digger was in many cases washed, with the result that better finds were obtained out of the same ground than the early digger with his sieving and dry-sorting had ever been able to attain. In these early days few made fortunes and many scarcely succeeded in paying their expenses. But the work, with its chances and possibilities, exercised a wonderful fascination.

> Hope springs eternal in the human breast,
> Man never is but always to be blest,

are lines which apply especially to the digger. New comers, eager to win fortunes, succeeded those who had left with

fortunes made or more often in despair of making them. The population continued to increase. Those who failed in digging in some cases did well as brokers, merchants or buyers. It was said that in those days for a diamond buyer only three things were requisite, namely, a pair of top boots, a courier bag, and half-a-crown; and if a man could do nothing else he could at all events try his hand at the occupation of a journalist, or turn to the remunerative calling of a law agent.

Soon after De Beer's Mine was opened, another discovery, the most important of all, was made. A few weeks ago, when Kimberley was preparing to celebrate the opening of the railway with appropriate rejoicings, a telegram was put into my hands by a member of the Festivities Committee, who asked what I thought it meant. It came from one of the leading residents of Colesberg, and was worded as follows:—"Send tickets railway opening. Original Colesberg Kopje." I suggested, and my interpretation afterwards proved to be correct, that the telegram meant that at the opening of the railway the claims of Colesberg to be represented ought not to be ignored, since the Kimberley Mine was the original "Colesberg Kopje;" and indeed one sometimes sees letters and newspapers arrive at the Diamond Fields addressed to "Kimberley, Colesberg Kopje, Griqualand West," just as some of the old inhabitants of Du Toit's Pan are still in the habit of speaking of Kimberley as the "New Rush."

It was in July, 1871, that a party of diggers from Colesberg, headed by Mr. Rawstorne, first sunk a hole on another part of the Vooruitzigt farm, not far from De Beer's, and that hole was the beginning of the big hole which has since become famous throughout the world as the Kimberley Mine; and it may not be inopportune, speaking on this occasion and in this hall, to remember and to acknowledge that the first discovery of that marvellous addition to the wealth and resources of this colony was due to the energy, the enterprise and the good fortune of a small party of pioneers hailing from the Eastern Province.

Indeed, the contemplation of the history of the Diamond Fields for the last fifteen years is something marvellous. I do not propose to weary you, more than I can possibly help, with statistics. "Nothing," it has been remarked, "is so fallacious as figures, always excepting facts." And whether it be true or not that figures can prove anything, at all events their copious use is open to this objection, that it almost invariably repels and often nauseates the hearer.

It was in the end of 1871 that the Kimberley Mine was opened, and the first licences given out; and Mr. Oats, an engineer of experience on the Fields estimates that in the five years ending 1877 about 4,000,000 tons of diamondiferous soil and about 500,000 tons of reef were removed from the Kimberley Mine at a cost of £5,000,000; and that the value of the diamonds won during this period was £10,000,000, thus leaving a net profit of five millions, or an average of one million per annum. I will not here attempt to enlarge upon the benefits which this great wealth-producing centre has conferred directly, and indirectly, upon the colony at large. Your merchants at Port Elizabeth probably could speak much more authoritatively on this point than I can. Perhaps the most remarkable and palpable evidence of those benefits lies in the fact that through the existence of Kimberley you have been enabled to complete a magnificent system of railways, of which any colony might be proud, and you are in the way to push your trade to the interior, as far as the banks of the Zambesi, and to revive the flagging prosperity of Port Elizabeth by making it the emporium and the principal port, as Kimberley is the metropolis, of Southern Central Africa. But still more wonderful are the effects which the discovery of diamonds has produced on what was once the dreary and arid desert, ranged over by Griqua tribes alone, of Griqualand West.

Sixteen years ago a vast European population suddenly occupied that desert, formerly only fit, in the words of Burke, when he speaks of the origin of American Colonization, "to amuse you with tales of savage men and uncouth manners;" the farms of Vooruitzigt and Dorstfontein were covered with tents and huts; every possible hardship was experienced; water was so scarce that there are tales of diggers using imported soda-water for their weekly baths, as being less expensive; the necessaries of life could scarcely be obtained, the luxuries were entirely unknown. Now, when you favour us with a visit—and I hope some day Kimberley will have an Exhibition of its own—instead of journeying for weeks in a wagon, you are carried to your destination in twenty-eight hours in a Pullman car; and when you arrive there you find an established town, with all necessary public institutions; with that *sine qua non* of municipal prosperity, a healthy corporate spirit; with an abundant supply of water, which, following the example of Port Elizabeth, has been brought sixteen miles from the Vaal River; with well-kept streets illuminated by the electric light, thereby setting an example for

Port Elizabeth to follow; with churches, schools, two daily newspapers, a good club, a growing library—last year our revenue at the public library amounted to nearly £1,200, and we added more than 1,000 volumes to our shelves; well-built and commodious banks—commodious, at all events, in the architectural sense of the word; hotels and stores; in short, were it not for those abominable dust storms, and the occasional liability at certain seasons of the year to fever, a place where the colonist might be well content to make his home. The sensation experienced by one re-visiting the Diamond Fields after an absence of some years, or visiting it for the first time in the expectation of finding a typical mining camp, such as those depicted in the works of Bret Harte, must indeed be not dissimilar to that experienced by Æneas, as he gazed in admiration on the new community which Dido, and the Phœnician refugees who shared her exile, had created on the Libyan shore:—

> Miratur molem Æneas, magalia quondam;
> Miratur portas, strepitumque, et strata viarum.

> "The stranger admires the lofty buildings, where stood
> Huts erewhile; admires the hum of men, the busy
> Throng, the well-paved streets."

The Kimberley Mine, though far the richest of the four great mines of Griqualand West, is also the smallest; it contains less than 400 claims. The largest, and also the poorest, mine is Du Toit's Pan, with some 1,500 claims. Bultfontein contains about 900, De Beer's about 600.* The superficial area of Kimberley is about $7\frac{1}{2}$ acres, Bultfontein 18, De Beer's 13, and Du Toit's Pan 29. In 1884 Kimberley had been sunk to a depth of 400 feet, De Beer's 250, Du Toit's Pan and Bultfontein between 100 and 200. All these depths have since then been increased, and some parts of the Bultfontein Mine—of which a very complete model on a large scale will be shewn at the London Exhibition—have now reached a depth of 250 feet. When Kimberley was laid out in claims, advantage was derived from the experience of the past, and care was taken not to repeat the errors which had produced so much difficulty in the early working of the other mines. Instead of allowing each digger to work as he liked and deposit his ground where

* The number of claims assessed in December, 1885, was:—Kimberley, 338, De Beer's, 591; Bultfontein, 886; Du Toit's Pan, 1,420. The average assessed value per claim was:—Kimberley, £8,250; De Beer's, £1,575 Bultfontein, £469; Du Toit's Pan, £762.

be pleased, the principle was now recognised that all excavated ground should be removed at once to the margin of the mine. Accordingly to each claim of 30 feet there was attached a servitude of 7½ feet to form a roadway, and by taking these 7½ feet from alternate sides of adjacent claims, a roadway of 15 feet was formed between each row of claims, on which the ground from both was removed in carts. Traces of one of these roadways may be seen in Mr. Pahlke's interesting model, shewing a sectional block of a portion of the mine as it appeared in 1873. But as the diggers worked down they began to excavate beneath the roads. In places bridges were made, and in time each road became a sort of viaduct, resting on pillars or blocks of blue. As this sort of work continued, and these detached blocks remained exposed to the air, the natural result ensued. In August, 1872, most of the roads collapsed, and other methods of getting out the ground had to be devised. By this time the attention of most diggers had been attracted to the riches of the Kimberley Mine. As long as the method of dry-sorting obtained, Du Toit's Pan and Bultfontein on the whole proved scarcely payable; and portion of the former mine is still known by the name of the "graveyard," owing to the amount of money and labour which has been vainly sunk in it by the over-sanguine and ever-expectant digger. At Kimberley, however, where a township was established in 1873, far better results were obtained. While the first question asked of the Bultfontein or Du Toit's Pan digger by a friend who met him was, "Have you found anything lately?" and the answer received was too often in the negative, the question addressed to the fortunate worker in the Colesberg Kopje invariably was, "How many have you found lately?" and the answer given was, generally, such as to provoke the envy of the worker in the poorer mines. Claims in Kimberley were the subject of great competition; they were owned in fractional shares, down to ⅛ and even $\frac{1}{16}$, and changed hands at constantly increasing prices. In the early days £50 was considered a high price for a claim. But in 1880 four claims were put into a Company at £25,000 each, and not long afterwards the £100 shares of the Central Company were sold for the sum of £400, being equivalent to a value, no doubt an exaggerated value, of £32,000 per claim.

When the roadways collapsed at the end of 1872, it is estimated that the Kimberley Mine belonged to about 1,600 owners. In 1873 hauling gears, with a windlass at top, and leathern buckets, hauled up along the ropes, each worked

by four natives, were introduced, as a substitute for the roadway system. At this time the greatest depth of the mine was about 100 feet, and the output from each gear was from 7 to 10 loads of 16 cubic feet. In 1874 horse whims, of which there is a model in the Exhibition, first began to be used. The ground was then hauled over wires, as shewn in the model previously mentioned, in tubs of about 3 cubic feet capacity, and by this means the output was increased to about 40 or 50 loads per diem. About this time the first washing machine was introduced, the cradle ripple machine, very simple and elementary, of which also a model is exhibited, and by which the wasteful system of dry-sorting was soon superseded. In the following year the cradle ripple was itself supplanted by the rotary machine, and from that time to this successive improvements have been effected in the washing machines employed on the Fields, until you arrive at length at the very elaborate machinery and gear of which an admirable working model, exhibited by Mr. Blackbeard, the manager of the Griqualand West Company at Du Toit's Pan, is to be seen in the machinery section of this Exhibition. So much for the washing gear; as to the method of hauling, the horse whim, as I have said, was introduced in 1874; in 1877 several hundreds of these whims were still in use, and a few of them were to be seen quite recently at Du Toit's Pan. But since 1877 they have been gradually replaced by steam-engines, specially devised for the requirements of the Diamond Fields, of which in the year 1881 there were over 200 actually at work in the four mines. With steam hauling and washing gear, the number of loads hauled and washed has increased from 40 or 50 to 400 or 500 per set of gear.

The cost of transporting all this machinery to the Diamond Fields by means of bullock wagons was, of course, enormous, and only equalled by the cost of using it when it had been erected. No coal being procurable, the engines had to be specially constructed for the consumption of wood as fuel; and the demand for fuel led to a lamentable deforestation of the country for many miles around. Farms were sold for enormous sums—as much in some cases as £10,000—for the value of the timber, which was cut down and sold at Kimberley at fabulous prices, sometimes approaching £10 a ton; and as it is estimated that 2½ tons of wood are equivalent to about one ton of English coal, it follows that it would have paid the miner to use English coal, if he could have got it at £20 a ton. It can now be laid down on the Fields at about £6 a ton.

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The cost of labour was also enormous. For skilled labour fancy prices were paid. For the rough work, some 12,000 Kafirs were employed in the four mines, at a weekly wage averaging, perhaps, 20s. It is estimated that a Kafir in the De Beer's Mine can pick the ground and fill trucks at the rate of about 25 loads *per diem*. This is very good work; and if the blue is exceptionally hard, his labour may produce only five loads per diem. As a rule, for every seven or eight Kafir labourers there is a white overseer, and the number of Europeans actually employed in the mines may be put down at about 2,000. I suppose that the amount spent annually in wages by the owners of the four mines, may be put down at about one million sterling. And it may give you some idea of the scale of operations when I mention that, during the last year the De Beer's Mining Company, who own about two-thirds of the De Beer's Mine, were hauling considerably over 2,000 loads a day, and at the present time they have about 200,000 loads of blue ground awaiting pulverization on their depositing floors, and of which the net value, after paying all expenses, is, I suppose, at least £125,000. One or two other companies, such as the Bultfontein Mining Company, have been working on an almost equally extensive scale.

I may here give you a few figures as to the De Beer's Company. I have promised that I will not give you many, but these I think may not be without interest, as illustrative of the results of the working of the largest company in the De Beer's Mine, a mine which, it must be remembered, is distinctly inferior in richness of ground to that of Kimberley.

Year ending March 31.	Capital.	Cost per load.	Carats per load.	Price per carat.	Yield per load.	Profit on cost.	Profit on captl.	Dividend.
1882	£665,000	14/8	·80	27/0	21/8	52⅛	5⅛	3
1883		14/6	·90	21/3	19/1	34⅛	6½	5⅜
1884	£775,000	13/0	1·02	22/5	22/10	75	13¼	7
1885	£1,045,000	11/3	·85	20/8	17/9	59	13⅛	7½*

Taking the production of the four mines generally, as to the early years it is difficult to obtain trustworthy statistics, and really accurate figures can only be procured for the period since the proclamation of the Diamond Trade Act,

* Up to the end of 1885, this Company had paid over £243,000 in dividends, on a capital gradually increased from £200,000 in 1880, to £1,045,000 in 1885.

that is, since September, 1882—accurate, that is to say, as to diamonds which have found their way into the hands of their owners, but not taking account of those stolen and illicitly exported, which form undoubtedly a large percentage of the whole—a per centage which, notwithstanding all the precautions which have been taken, probably no one competent to give an opinion would put at less than 20 per cent, and which many well-informed persons consider may be as high as 40 per cent. In the four years 1874–7 it is calculated that about a ton's weight of diamonds were exported from Griqualand West, and probably in none of these years did the export fall far short of one-and-a-half million carats. In the five following years the average annual export was probably about three millions, while in the period of thirty-one months from September, 1882, to March, 1885, duty was paid on 5,993,630 carats, valued at £6,689,042. These were distributed between the four mines as follows :—

	Carats.	Value.	Average per carat.
Kimberley...	2,112,000	£2,072,000	19/7½
De Beer's	1,218,000	£1,317,000	21/7½
Du Toit's Pan	1,283,000	£1,849,000	28/10½
Bultfontein	1,379,000	£1,449,000	21/0½

Among the diamonds exported during this period were 33,042 stones of 10 carats and over, and about 1,600 single stones of over £100 value, and of the aggregate value of over £300,000, or an average of nearly £200 a-piece. Among the largest stones recently found I may mention one of 352 carats, found by Mr. Turabian, a digger at Du Toit's Pan, in February, 1885, and another of 404 carats, found by the Griqualand West Company in the same mine in the following September.

The following table shews the total exports and their value during the three years 1983-5 :—

Year.	Carats.	Value.	Average per carat, about
1883	2,418,954	£2,742,521	23/0
1884	2,263,686	£2,807,288	25/0
1885	2,440,788	£2,492,755	20/0

In my sketch of the history of the Diamond Fields I have taken you up to the period, nearly ten years ago, when

steam machinery began to be used. Of the subsequent period time will permit only the most cursory sketch; and indeed, being more recent, it is likely already to be more familiar to you. It may be observed, generally, that with the introduction of elaborate machinery and expensive appliances the days of the original digger were numbered, and the system of numerous minute individual holdings could no longer prevail. Fractions of claims were bought up by the small capitalist, and he in turn made way for his wealthier neighbour. Capital was imperatively necessary for the working of the mine; the diggers began to amalgamate their holdings, and it was a case of the survival of the fittest. The reef, too, of which I have already explained the nature—friable shaley ground, which down to a depth of nearly 300 feet forms the margin of the mine—began to become troublesome, and large sums were expended in its removal, without, however, any permanent success in preventing the recurrence of fresh slips. Towards the end of 1880 there began, not for the first time either in South Africa or elsewhere, what is known as the "company mania." About this time certain valuable claims, belonging to Messrs. Baring-Gould, Atkins, Tracey, Newberry and Marais, in the centre of the Kimberley Mine, were formed into the Central Company, with a capital of £576,000, or at the rate of £8,000 per claim. The company was at first a great success—and I have no doubt it is destined, if properly managed, to be a great success in the future—some good dividends were paid, the shares went to an enormous premium, and the example thus set was speedily followed in all the mines. Some of the companies formed at this period were rich properties, with all the elements of success, and, although most of them have suffered in the past from extravagant management and other extraneous causes, there are several which have formed investments which shareholders have had no reason to regret. Unfortunately, *decipit exemplar vitiis imitabile;* and many of the mining companies, formed at this period, had inherent vices, which could lead only to one end. For the moment every one thought his fortune was made; scrip, good, bad and indifferent, all went to a premium with equal rapidity; and each happy holder of scrip certificates thought he had an Eldorado in his pocket. Companies were formed with an aggregate capital of about £6,000,000; but of this, probably, about one-half was promoters' scrip, representing a portion of the purchase-money of the claims; of the rest only a small portion was at first called up; the banks showed them-

selves most accommodating in making liberal advances on mining scrip; and all went gaily as the proverbial marriage bell.

The reaction, however, was not long in coming. Some say it was the banks began it. They began to be not quite satisfied with their "cover," and with injudicious precipitancy changed their policy and insisted on customers squaring their accounts. This, however, was but one factor in the situation; and sooner or later the end must have been the same. In all countries and in all periods mania is followed by panic as certainly as the night succeeds the day; and, of course, where the local capital is small and there is no foreign capital to be attracted by a fall in the market, the crisis is certain to be all the more sudden and the more severe. The promoters began to want to realize the paper which represented their former properties; those who had obtained allotments merely with the view of selling at a premium thought, or were persuaded by the banks to think, that it was about time to realize; calls began to be made and were not responded to; in consequence, even in the case of sound concerns, working capital was wanting. Expensive machinery had been ordered, and when the bills came in there were no funds to meet them. The reef came down, as it always does, just at the most inopportune moment. Everyone rushed into the market with his scrip. Port Elizabeth and Cape Town swelled the band of sellers; but as for the buyer, he was nowhere seen. I need not dwell on the melancholy consequences; you experienced your full share of the troubles of those disastrous days; there are few among us who were not sufferers to a greater or less extent; it is a lugubrious picture; but I hope and believe I am not over-sanguine in saying the worst is over.

Those Diamond Mining Companies which survived the misfortunes of 1882 and 1883 are not likely to have worse days in store for them. The worthless ventures have succumbed; and those which have weathered the tempest and still breast the wave—I fear it might be said *rari nantes in gurgite vasto*—have profited by the experience and redeemed the errors of the past, and I trust are all likely to come safe to port.

Mining, as an investment, must always be more or less speculative; it is not an investment for guardians or trustees; but, although it would be invidious to mention names, there are several diamond mining companies in which the man of business might now invest a moderate portion of his capital, with every probability, at present prices, of getting an excellent return for his outlay, and

every prospect of holding a property which is likely, in the future, rather to increase than to diminish in value.

As I have said, however, mining investments are always speculative, and it would be wrong to lead you to suppose that all difficulties have been surmounted. On the contrary, there are many problems with which we are now only beginning tentatively to deal. It seems quite clear that open working cannot be carried on with a reasonable degree of safety beyond a depth which, in the Kimberley Mine, has already been attained, and the attainment of which in the other mines is within a measurable distance. Accidents, indeed, have always been painfully numerous. I remember once hearing a Kafir say, when he was charged in Court with stealing a diamond which was found in his possession:—"Of course I stole that diamond. Do you think I was going down into that dangerous mine for a morsel of pap, and perhaps to lose my soul?" And really there was considerable force in that argument. As far as the Kimberley Mine is concerned, it may be said that open working is now in course of rapid supersession by the system of shafts and tunnels. So long ago as 1883, when Mr. Paxman read his paper before the Institute of Civil Engineers, there was an almost complete consensus of professional opinion that the shaft and tunnel system was the system of the future; and all experience subsequently has tended to confirm that view. Several shafts have already been sunk at great expense by various companies—among others by the French and Central Companies at Kimberley, and the De Beer's Company in that Mine; and these shafts now form a valuable asset of those companies.

Unfortunately, since the introduction of this system, although every available precaution, I believe, is taken, there has been a marked increase in the number of fatal and serious accidents; and I am informed by the Government Inspector of Machinery that the number of such accidents in 1885 will probably prove to have been double that in 1884, in which year the total number of such accidents in the four mines was 43. I have no hesitation in saying that the danger of working in the mines has increased, is increasing, and ought to be diminished. Some new regulations for safety have been recently promulgated by Government, but I am informed that these regulations were drafted several months ago. Some material changes have since then taken place; much experience has been gained; and I think it not improbable that these regulations will, before long, themselves require considerable revision.

Another question is whether the poorer mines, such as

Du Toit's Pan, where the reef has already proved somewhat troublesome, will be able to bear the cost of underground working. Should the present tendency to a diminution of price, corresponding with increase of output, continue, the question may almost certainly be answered in the negative. Du Toit's Pan has hitherto managed, more or less, to pay its way, notwithstanding the comparative poverty of the ground, by means of the exceptional quality of its diamonds. You will have observed in the returns quoted just now that, while the average value of Kimberley stones, during the four years 1882-1885, was only 19s. 7d. per carat, that of Du Toit's Pan stones was 28s. 10d. per carat. But it is also significant to observe the value of Du Toit's Pan stuff —and that of the other mines is proportionately very much the same—during each of those four years themselves. Excluding farthings throughout, it was, in 1882, 32s. 9d.; in 1883 there was a heavy fall to 26s. 4d.; in 1884 there was a recovery to 30s. 5d.; but the first three months of 1885 shew a fall to 25s. 6d., and I do not know that there has been any marked improvement since. Now the cost of working at Du Toit's Pan under the present system, and in favourable circumstances, cannot be put at less than about 4s. a load. That is indeed very cheap working. In many parts of the mine the average yield does not exceed $\frac{1}{6}$ carat to the load, or one carat to every six loads. By a simple arithmetical computation you will at once see that if Du Toit's Pan stuff does not fetch more than 24s. in the market, it will not pay for working.

These figures will also prove another thing, and that is that, however great the output, there is no fear of diamonds becoming so cheap as to lose their value; the cost of production will always be great enough to prevent any great risk on that score. That is, of course, if the Diamond Fields of South Africa retain their present practical monopoly.

I have already given you some reasons for believing that the danger of competition, so far as can be foreseen, is not at present very grave. If you look at a map in the Exhibition you will see several red patches which are meant to indicate supposed pipes of diamondiferous ground in various parts of Griqualand West—Otto's Kopje, Taylor's Kopje, Kamfer's Dam, and the like—but most of those have before now been pretty well tested, and there seems no great prospect of their ever proving payable diggings. It is, however, quite possible that increased production, combined with increased cost of working, may seriously threaten the

future of some of the mines unless a remedy is devised in time. The remedy most in fashion is that of the amalgamation of the various holdings, with a view to obtaining a control over the market; and no doubt in "unity is strength." The difficulties, however, in the way of anything like a universal voluntary amalgamation are very great. If it is ever carried out, the diamond interest may profit, but Kimberley as a community would certainly reap no benefit from such a change; neither, I imagine, would the Colony at large regard it as entirely satisfactory for the incalculable mineral wealth of the Diamond Fields to pass into the hands of a foreign company, whose only aim would be to get as much out of Griqualand West at as small a cost as possible.

To meet these objections, it has been suggested in other quarters that the Colony itself, following the example of the Government of Brazil, might acquire the Diamond Fields. I believe it has been calculated that a Government, armed with reasonable Parliamentary powers, might acquire the four mines, in a manner not inequitable as far as the present owners are concerned, for the sum of about £5,000,000; that the Colony could readily raise such a sum for such a purpose at 5 per cent., which means an annual interest of £250,000; and that Government with the means at its disposal could easily work the mines so as to obtain an annual profit of £500,000. If these figures are approximately correct, it is obvious that in a very few years the entire debt would be paid off, and the Colony would possess an enormous addition to its revenue; and I am quite confident that neither Mr. Sprigg, nor Mr. Pearson, nor any Colonial Treasurer that ever was or ever will be, nor any man who breathes the air of Parliament, would despise an annual addition to the revenue of the Colony of half a million sterling.

I promised before concluding that I would say a word or two about the future prospects of the Diamond Fields; and you may possibly think that in endeavouring to redeem that promise I have allowed the wings of imagination to carry me too far. The scheme to which I have adverted is one which any prudent statesman would certainly think thrice before attempting to carry out; it would undoubtedly involve a pledging of the credit of the Colony for a more or less speculative project; it might tax the financial ingenuity of some colonial Gladstone, and require the political audacity of a colonial Danton. As far as Kimberley is concerned, moreover, the scheme would be open to some of the same

objections as beset the possible monopoly of some foreign syndicate; but if this or that proposal is clearly for the benefit of the Colony at large, Kimberley, as a community, of course must take its chance. I confess, however, that I am inclined to be very sanguine in my belief that the vitality of Kimberley is likely to prove pretty tough. It has recently been felicitously described by H. E. the Governor as "the metropolis of the interior of South Africa;" and I believe that the town of Kimberley, whatever the vicissitudes of the diamond diggings and the diamond market, has before it a great commercial future.

We have recently obtained the missing link which we so long desired. I dare say you may remember that fine passage, in one of the speeches of Mr. Bright, in which he refers to the restoration of the broken cable between England and the United States. The iron hand, he says, went down into the depths of ocean and found the lost cable, and joined the ends which were severed, and made two nations one. We recently have been linked together by an iron hand; earnestly do I trust that the closer material union which we now enjoy may be the precursor of a closer moral union; that we may draw closer to one another in mutual understanding, mutual appreciation, mutual respect; in that case we shall soon realize how complete is the identity of our interests; and that our only rivalry should be a rivalry in the endeavour to promote, each in his own sphere and with his respective means, the prosperity and the progress of our common country. That I trust will be one of the lessons which this Exhibition will help us all in learning; that is the moral which it ought to point. If that lesson be taken to heart, and that spirit be imbibed, I think we need not be over-anxious for the future of Kimberley; we need not be disquieted about the future of Port Elizabeth; we need feel no fear for the future of this Colony of Good Hope.

XIV.

STOCK-BREEDING.

By J. B. Hellier.

Live-stock constituting so largely the wealth of the Colony, and furnishing as it does its chief sources of income and revenue, it is a matter of great importance both to the farmer and to the State, that our flocks and herds should be of the best and most profitable kind.

It has often been said, it costs no more to keep a good animal than a bad one.

But this is not all; the propagation of inferior stock determines largely the diminished value of the stock of the future, while all improvements steadily and intelligently persevered in, will hand down to coming years and generations, flocks and herds which will form sources of wealth and steady enduring national prosperity.

What may be the relative numbers at this time, I am sorry to say it is very difficult to estimate.

While the necessity for the improvement of our flocks and herds is pretty generally acknowledged, the amount of skill, experience and information necessary to successful stock-breeding, has somehow got to be greatly underrated, and it is deemed about the easiest of all farming operations.

The idea seems to be that if you secure good animals, and especially imported sires, all the rest is plain sailing; in fact that it is, at the most, a question of the outlay of money; whereas it is more a question, in fact, of the exercise of brains.

I have known, in England, that men have laid out thousands in the purchase of thorough-bred stock, and left off, after years of toil and expense, with a worse lot than they began with; while others I have known, who have expended little in the purchase of stock, but possessing a talent for stock-breeding, have, after a few years, acquired most valuable herds. And I think that even in this country we have not derived the amount of benefit from imported stock that we may have anticipated.

That some men have special aptitude for stock-breeding, something like the talents displayed in other arts, the

history of the improvement of the flocks and herds of modern times, abundantly proves. Some of the most valued herds and flocks of to-day owe their origin or their improved form to the labours of single individuals; as Bakewell, the founder of the Leicester sheep; Collings of the short-horns; the Davys of the Devons; Ellman of the improved Southdowns; and Learmonth of the Ercildoum flock of merino sheep in Australia.

Yet while we must concede the fact of the possession by some men of special aptitude for this work, the art or science of stock-breeding has for its basis several important natural laws, which laws the successful stock-breeder must accept for his guidance, and with which he must always work in harmony.

For it will be found that anyone who gets at cross purposes with Nature or tries to *force* a condition of things contrary to natural laws, is sure to meet with defeat and disappointment.

Such, for example, is the result of trying to keep up a large kind or breed of sheep on poor pasturage, or where the food supply is but limited; and then when the sheep and the food supply are coming into harmony, introducing big newly-imported rams, to keep up the contest, trying to keep up the size.

Of these natural laws which affect stock-breeding we can only look at a few of the most important.

Natural Laws.—We Begin with Heredity.

One of the most important laws of organic life, as it affects stock-breeding, is *Heredity*, or that which is expressed in the maxim "Like begets like."

This is not only true of the immediate parents and progeny, but of the newest progeny in relation to its remote ancestry. Therefore, a newly-born creature is the progeny of the *race* as much as it is of its immediate parents. Or as Professor Agassiz puts it, "The offspring is not the offspring of father and mother, but of grand-parents as well," all its ancestry in fact. Though in stock-breeding we have to do with domesticated, animals and as such of more or less mixed ancestry or descent, and therefore more liable to variation and reproduction of ancestry, called "Atavism" (and of which I shall have to speak presently); yet to view Heredity in its simplest operation, I will take the case of the wild undomesticated animals. All wild animals are *pure-bred*, or, as we say of stock, thorough-bred. And here we

have a most important fact which may be used in illustration of our subject of stock-breeding generally.

First they are, with trifling exceptions, like their parents. "They come true," to a streak of hair, or a feather, and with the slight modification made by climate and food supply, are all exactly alike. There has been no crossing; and consequently in the operation of the law of Atavism or throw-back-to-ancestry, there can be but the reproduction of a pure-bred animal. In this way the wild herd or flock keep as alike as possible. I much question if the lion from the Sahara Desert to-day is little different from the lion whose roar shook the Roman amphitheatre 2,000 years ago. The animals preserved in the mummy cases 3,000 years old are just like the animals of the Nile to-day.

Well-established breeds of stock, by persistent selection and skilful breeding, attain to something like the same permanency of character possessed by the wild animals; and this constitutes the value of *pedigree*, the almost certainty of the reproduction of a good animal even if an ancestor of ten or fifteen generations back turns up.

Atavism is the scientific term which has been adopted to express what is known to breeders as "throwing back," and forms one of the chief difficulties in improving a herd or flock, and renders crossing for this purpose so disappointing. For it is not impossible that the remote ancestor that puts in his appearance may represent the most inferior branch of ancestry. Of course it is not meant that the unwelcome representative of the past comes in full figure and qualities, but more or less of its undesirable qualities exhibit themselves.

It has been observed where portraits have been preserved of a long line of ancestors, that every fourth or fifth portrait has much more resemblance to each other than to the rest. The great-grandfather is reproduced.

Mr. Darwin gives the following case of *Atavism*. A pointer bitch produced seven puppies. Four were marked blue and white, which is so unusual a colour with a pointer that she was thought to have played false with one of the greyhounds, and the whole litter was condemned; but the gamekeeper was permitted to save one as a curiosity. Two years after a friend of the owner saw the young dog, and declared that he was the image of his old pointer-bitch Sappho, the only blue and white pointer of pure descent he had ever seen. On close inquiry it proved the young dog was the great-great-grandson of Sappho.

In a large family we seldom find all the children resemble father or mother; and in many instances there is one or

more that takes after, as we say, a grand-parent or some more remote ancestor.

This reproduction of ancestors, though it may cause no diversity in a wild or pure-bred herd or flock, is the source of great, I may say, endless variety amongst the human family and our ordinary domesticated animals.

For while in a true-bred herd of fixed type, the reproduction of ancestors may tend to consolidate and add to the permanence of the marked characteristics of the breed, in the case of mixed ancestry it is impossible to say which line of descent will be represented by the new comer. In twenty-two generations, provided there were no intermarriages (an impossibility, of course), we have about one million ancestors, so there is a wide scope for diversity.

VARIATION.—This feature or law of organic life, and especially its manifestation in our domesticated animals, is most important to stock-breeders. For though, as we have seen in the true-bred wild animals, and thorough-bred stock, the force of *Heredity* sustains all the leading features and peculiarities of the breed generation after generation, yet climate and food-supply or other unknown causes produces slight but observable variations. And it is the ability to observe these variations, when of a useful kind in our stock, which constitutes the special talent for stock-breeding possessed by the masters of this art.

A breeder may observe some special and valuable variation in a domestic animal. In the case of the bull Hubback, the father of the improved short-horns, Charles Collings observed a special aptitude to fatten on even poor pasture. Or it may be giving an extra quantity of milk, as in the case of his cow Lady Maynard.

In all the improved families of pure-bred animals, it is the perpetuation and accumulation of the *small* but valuable variations observed from time to time, that has constituted their sum total of perfection.

But to quote from Darwin, page 177, Vol. II., of the Animals and Plants under Domestication,—"I have been astonished when celebrated breeders, and whose skill and judgment have been proved by their success, have shown me their animals, which appeared all alike, and have assigned their reasons for matching this and that individual. The importance of the great principle of selection mainly lies in this power of selecting scarcely *appreciable differences*, which, nevertheless, are found to be transmissable and can be accumulated until the result is made manifest to the eye of every beholder."

Nothing has been done at a jump, but little by little,

improvement added to improvement, and these fixed and perpetuated by judicious alliances of animals having in the main the same qualities and whose variation from the original stock takes the same line of direction.

It is easy to see how fatal a cross would be here; it would undo the work of several generations.

Of course the building up or creation of an improved flock or herd requires great patience and perseverance. It has been, in most cases, the work of a lifetime; or, as in the case of the short-horns, pupils have succeeded their masters, and carried on the work on the same lines, with scrupulous regard to the same methods and practice over now nearly a century.

SPORTS.—But besides the force of Heredity and the operation of Atavism, and the more subtle or at least less observable development through Variation, we have sometimes a sudden departure and the introduction of an animal unlike, in some important features, either parents or ancestry. These sudden appearances amongst plants are called by gardeners "sports." One of the most remarkable "sports" amongst our domestic animals, was the ancon or otter-sheep of America. This breed originated with one ram lamb, whose legs were exceedingly short, while its body was the usual size. Its owner, by breeding and selection, raised a flock, and the variety amounted at one time to some hundreds of thousands, their chief value being that they could not jump the fences, while they were otherwise good sheep.

Occasionally there appears amongst our flocks of white sheep, a sheep totally black. And a lady in Scotland, by breeding from a few of these black sheep with selection, raised a flock of some hundreds all black. The occasional appearance of these black lambs, however, raises a curious question. Are they "sports" pure and simple, or Atavism? If the latter the "throw-back" must be to an ancestry of thousands of years ago, for there is no doubt but that the original sheep were tawny coloured if not black.

The way in which the abnormal peculiarity of a "sport" is established is by rigid selection.

There is a beautiful tree in England, the weeping ash; it is a "sport" from the common ash, but has pendulous branches like a weeping willow. If the seeds of this weeping ash are sown, about one-fifth of the plants take the weeping form, the rest the upright; but if, when these weeping trees bear seed, they are sown, one-third come weeping trees, and this repeated they would in time attain

to a settled type, or what the gardeners call true. The kaalblad is a "sport" of the prickly pear, but the seeds yield, for the most part, the original prickly pear. The above is about the method to be adopted with any "sport" amongst our domestic animals, where it is thought worth while to perpetuate any animal or abnormal quality.

RELATIVE INFLUENCE OF PARENTS.—The first thing I have to say on this most important section of our subject, and which is most important to be borne in mind by all stock-breeders, is this:—That the progeny is equally the progeny of both parents, and therefore of the ancestry of both parents.

This may appear a truism, but not only is this fact forgotten by amateur stock-breeders, but they expect a good sire to effect more than ought to be expected, he being only one half of the breeding power. But there has been an idea prevalent that the dam resembles a seed bed, into which the germ is deposited from the male. More exact scientific inquiry, however, has taught us that for the production of any new organic life there must be the admixture of the male and female elements. And that no new living being is procreated in any other way; and this in the most minute organisms as well as in the case of our largest animals.

While, however, with the true-bred wild animals or the thorough-bred stock this commingling of the male and female elements may, and most likely is, an even blending of the two; with mixed breeds or no-breeds of our stock, and especially where crosses are made, the admixture of the two parent elements, as seen in the progeny, is decidedly composite.

And the great authority on this subject of Heredity, Mr. Francis Galton, in his late lecture before the Royal Society for the Advancement of Science, said:—"There can be no doubt that heredity proceeds to a considerable extent, perhaps principally, in a piecemeal or piebald fashion, causing the person of the child to be to that extent a mosaic of independent ancestral heritages, one part coming with more or less variation from this progenitor, and another from that."

This, of course, is in consequence of the Mixed Ancestry of the human race, which he was speaking about more especially.

In making crosses, this fact is very apparent. When the otter sheep were crossed with the ordinary sheep the progeny, as a rule, had either the short legs of one parent or the long ones of the other, and but rarely of medium

length. We have had white mice escape, and when mated with the ordinary mice about the house, the progeny was not a pale fawn colour, but the little animals were piebald.

And where a tall man marries a short woman, the children are rarely just medium height, but some are tall and some short.

PREPOTENCY.—But while there are these facts of the admixture of the qualities of both parents, and the evidence of mosaic work in the progeny, yet there comes into play another factor which regulates, often to some large extent, the issue of the mating of two animals. This is *prepotency*, which is the term used to express the fact, that one parent has greater influence than the other in impressing its individual character on the offspring.

This power of prepotency is specially the quality of pure-bred stock. The force of their long descent tells on the progeny, and it has been found that a high-bred male will throw a progeny more decidedly like himself when coupled with under-bred females, than when with females of his own grade; though, of course, the progeny of the truer-bred is the most valuable.

As a male represents half of the breeding power, practically, of a flock or herd, prepotency, or the transmission of his most valuable qualities, is one of the most important characteristics of a sire. Therefore in buying a sire, where his progeny can be seen, the qualities of these are a better guide to a would-be purchaser than any judgment to be formed of the sire himself. For it is not the sire himself that constitutes his value, but what his progeny will be in the third and fourth generation.

THE EFFECTS OF PREVIOUS IMPREGNATION.—This curious feature in the processes of animal procreation can hardly be passed over, as it may sometimes come into operation to the surprise and disappointment of the stock-breeder. For from all the testimony of most reliable witnesses and the evidence of facts, it is undoubtedly established that the influence of the male is not limited to his immediate offspring, but that the female impregnated retains, in some way, the effects of this conjugation, and it is exhibited in her offspring by another male.

The case of the mare mated with a quagga, which showed in the next three foals by an Arabian horse the marking of quagga sire, has often been quoted.

A pure Aberdeenshire heifer was served by a pure short-horn bull, and bore a cross-bred calf. Next she was in calf by a pure Aberdeenshire bull, but the produce was a

cross calf, which when two years old had long horns, though both its immediate parents were polled or hornless.

Cross-Breeding.—By this is meant, strictly speaking, the pairing of animals belonging to distinct breeds, and is the opposite of breeding in-and-in.

The breeding of animals of two different species, as the horse and the ass, is properly hybridism, the progeny of which is infertile.

The term "crossing" is sometimes used to describe breeding between two strains of the same breed, as would be that of a Rambouillet and Australian merino.

Leaving out all the "happy-go-lucky" cross-breeding so generally practised, resulting in the production of mongrels, with few of the good qualities of any breed, but the bad qualities of all; we will see what are the advantages of the intelligent adoption of this method.

It is contended for by Darwin and other naturalists that Nature provides for cross-fertilization of plants and maturing of animals not related at more or less remote intervals. But we think the necessity is so remote in the case of domestic animals, that it is not a necessity, or to be taken into account at all for successful breeding.

The most successful experiment in cross-breeding is the production of a new breed of sheep, the "Oxford downs," which has been obtained by crossing Cotswold rams with South-down ewes. This has been the patient work of many years, and the patrons of the breed believe they have secured a better sheep than either of the stocks from which they are descended, but of which I am myself rather doubtful. The case of C. Collings making a cross with a Galloway, has been often cited as an instance of the value of this method; and, in fact, I have heard it stated in this Colony that the improvement of the short-horn was all owing to this cross. The fact is he just dipped in to the Galloway's breed to see if he could give his short-horns their massive forms, shorter legs and beautiful coat. He did not use a Galloway bull. He put one of his short-horn bulls to a Galloway heifer, and the progeny being a bull he used him on one of his pure-bred cows, and never returned to their breed again.

That the cross-fertilization of plants and the introduction of new males into even wild herds may be Nature's method of keeping up the full vigour of the race, we may admit; but for our domestic animals, and as far as it relates to the perfection of our breeds, this seems to be requisite, but at long intervals. And even Mr. Darwin, who is an advocate

for cross-fertilization and cross-breeding, says:—That with cattle close inter-breeding may be carried on for years with no manifest evil; and so we have instances of flocks of sheep in which this has been practised without any apparent injury. Whenever it is deemed advantageous to introduce new blood into a pure-bred flock, every care is taken by the owners to select from a herd or flock as much like their own as possible.

One of the results of crossing, which greatly misleads and disappoints amateur breeders, is that often the progeny of an abrupt cross is a much larger animal than its progenitors.

And the result seems so promising that the progeny, if a male, is used in the flock, when the result of this is—all sorts and conditions of animals—hardly any two alike. For it must ever be remembered that crossing stirs up and brings out the power of Atavism in full force, and in an extraordinary way.

For beef in England, pure breeds are often crossed, never to be bred from, however; and in Australia they cross the Leicester rams with the Merino ewes, for the breeding of lambs to be fatted and sometimes for wethers.

Breeding in-and-in.—The breeding together of animals closely related to each other, without any reference to the degree of consanguinity, is termed "breeding in-and-in," or, to put it another way, "breeding in-and-in" is the coupling of animals that are of the same family and more or less nearly related.

There must necessarily be different degrees of this inter-breeding, and there has been a great variety of opinion on the subject. Though I am bound to say this, there is great unison of opinion amongst the more prominent stock-breeders. In fact all the great breeders who have founded the most valuable flocks and herds have practised it without a single exception.

There is no *magic* in the sire and dam being nearly related, but the value of the union lies in the fact that they each contain in themselves and inherit from their ancestry precisely the same qualities, and their progeny will, in all probability, exhibit the special and valuable characteristics of their parents intensified.

Could it be possible to obtain two individuals in every particular similar to the ones nearly related, they would be equally well mated, but as this is next to impossible, breeders make sure by mating near relations otherwise suitable.

Bakewell most notoriously bred in-and-in; as the pedigree

of his most famous animals show; and all the great breeders, down to the present day, follow on the same lines. The Collings and Booths, in improving the short-horns, all adopted this principle. And the most valuable strain of Herefords, founded by Ben Tomkins, are all descended from a bull and two heifers; and there has been no introduction of new or alien blood there for over eighty years. And these cattle are as healthy and fertile as ever.

Mr. Price, the celebrated champion of this breed, says:—"I bought from Mr. Tomkins a considerable number of cows and heifers and two bulls. I have kept the blood of these cattle unadulterated for forty years; and Mr. Tomkins assured me that he had bred the whole of his stock from two heifers and a bull selected by himself in early life without any cross or alien blood whatever. My cattle have, therefore, been bred in-and-in for upwards of eighty years, and by the far greater part of it in a direct line on *both sides* from one cow, now in calf for the [illegible] time. I have bred three calves from her by two of her sons, one of which is now the largest cow that I have possessed, the best form and [illegible]. The other two were bulls which have proved of great value; thus showing indisputably, that it is not necessary to mix the blood of the different kinds of the same race of animals to keep them from degenerating."

[illegible]

[illegible]

[illegible]

suitable to South Africa. From this book I venture to give you one or two quotations.

"For a period of twenty-five years the writer was engaged in testing the value of "in and-in" breeding. I may say I never saw an entire flock of really good sheep that was not wholly composed of *in-bred* animals, and I scarcely think it possible to breed good sheep without having recourse to "in-breeding." By "in-breeding" I do not mean indiscriminate breeding *without selection*; on the contrary, I mean breeding with *judicious selection*, that is, rejecting most rigorously the faulty sheep, male and female, and breeding only from the perfect.

"After some years of practical experiment I became so impressed with the paramount value of in-breeding, that I have on several occasions mated the son with the mother, and produced a far better sheep than the father of the son was. Let me on this vital point make myself understood. I put together the best ram and ewe in the flock, and if I found the offspring was a ram lamb, and that he possessed the qualities I required in a more eminent degree than his sire, I would put him to his own mother, and rest assured that he would beget a better sheep than either himself or his sire.

"It has been said that it is highly injudicious to breed from near relations having any tendency to hereditary disease. I should think so indeed! But who, in the name of common sense, would dream of breeding from ovine near relations or no relations, either of whom had a tendency to hereditary disease or glaring physical inperfection?

"Against 'in-and-in breeding' it has been urged that it has a tendency to weaken the constitution: I can only say that in the whole of my personal experience, and in the practice of others, I never knew this result to take place."

So far Mr Graham, and I think his opinion was made up pretty conclusively. However, it must be remembered that "in-and in breeding" is a two-edged sword, and cuts both ways, for not only will it perpetuate and intensify good qualities, but equally intensify and perpetuate bad ones; and here comes in the grand principle of *selection*. And on account of the polygamous habits of our flocks and herds, a most rigid selection can be made of one half of the breeding power, by rejecting all but the most promising males, as we need retain but a small proportion for breeding purposes of those produced in our herds or flocks, say one in thirty or even less.

From the consideration of the foregoing natural laws,

and their utilization in stock-breeding, a few important facts and conclusions are evident.

First.—That the more valuable qualities of our domesticated animals, especially those which give increased value and usefulness to the more prominent breeds, are the result of skilful breeding. Of such induced or created qualities, is the extra speed in the English race-horse; the fine beef and large milk-producing of our improved breeds of cattle; and the snow-white, fine and silky qualities of the wool of our sheep.

Second.—That these more valuable qualities have been secured by the accumulation of a succession of small improvements, and their being intensified by breeding in-and-in, so that with the very rare exception, once upon a time, a cross like Charles Collings with the Galloway, or a sport like the Mauchamp sheep, nothing truly good has been done all at once or at a stroke.

Third.—That none of these improved qualities of our stock are of the least benefit to the animals themselves, to wit, the sheep is no better able to enjoy life covered with a close fleece of heavy wool than his earliest progenitor who roamed the mountains in a light tawny coat with the lithe and active limbs of a deer, nor is our domestic pig any better able to fulfil his little round of existence for being smothered in fat; but the long-legged, long-snouted wild ancestor seems certainly to have a more free and enjoyable life.

Fourth.—That our domesticated animals having thus been brought into, in some degree, an abnormal (I hardly like to say unnatural) condition, there will be a constant tendency in them to accommodate themselves to their surroundings. And if such be unfavourable, and they are left to themselves, if they do not return to a wild state they will at least lose very many of those qualities for which they are now especially valuable. They therefore require constant watching and careful selection.

And Lastly.—That the greater part of stock-breeders' difficulties are the result of having to do with the mixed ancestry of our domesticated animals, in fact with mongrels, and that sticking to pure blood is not only the way to success, but the only way to avoid trouble and disappointment.

PRACTICE.

The father and founder of the art of stock-breeding, as practised so successfully in modern times, was Robert

Bakewell, of Dirhley, who began to put into operation his improved method about the middle of the last century. He may be said to have created the breed of new Leicester sheep, improved long-horn cattle, and to have greatly improved the breed of the Shire or Black cart-horse.

He made up his mind as to what were the most valuable qualities for the animal or breed of animals under operation to possess; and then went steadily to work to induce the increase of these qualities in the progeny of his stock with each succeeding generation till they were attained in full perfection.

He thoroughly understood the connexion or co-relation of various forms and qualities to each other, such as small bones always being an indication of aptitude to fatten, and the reverse of the relation of large bones to coarse meat and excess of offal. His well-trained eye and sound judgment, with experience, enabled him to detect the slightest varieties of form, and he at once associated the co-related qualities they represented.

Bakewell began his herd of long-horn cattle with a few of the best animals he could get, and then bred steadily within these, without cross or change, to the end of his life.

He collected some of the best of the long-woolled sheep; they were long-legged, flat-sided, and difficult to fatten, and from this unpromising beginning he evolved, by his skill, the New Leicester sheep, a sheep that has done more for the English farmer than perhaps any other breed.

The Collings founded the improved Short-horns by getting together a few of the best Durham or Tees Water cattle; and, following Bakewell's plan, produced the most famous herd of modern times, some of which of late years have fetched fabulous prices.

Possibly one of the most instructive examples of this creation of an improved flock, is that of the improved South-down sheep. The South-down sheep is said to be indigenous to the Sussex Downs, and existed there before the Conquest, 1,000 years ago. It was only at the end of the last century that any attention was called to them, when Arthur Young mentions their hardy constitution and the fine flavour of their mutton. They were described as having long, thin necks, slack in the girth, narrow in the loin, flat ribbed, and narrow fore quarters. They were very small. Not at all a flattering picture.

About 1780 Mr. Ellman took these sheep in hand, and commenced a course of well-considered experiments on them. These experiments were *slow and steady* during the long

period of half a century. In 1800, however, he let one ram for the season for 300 guineas.

The next South-down breeder was Jonas Webb, of Babraham, who obtained rams and ewes of Mr. Ellman, with which foundation he soon made considerable progress, till at last these sheep were recognized as one of the most useful in the kingdom, and at this present time top the market for mutton, and bear the finest wool, so that they are perhaps the most valuable breed in England. Their weight has increased from some 60 lbs. net to 150 lbs. net carcase. In 1870 the three shearing sheep exhibited at the Smithfield Show weighed 242 lbs. each, live weight, and at the Show 1884, they weighed 251 lbs. each, live weight. And the symmetry of these sheep leaves nothing to be desired. Here we have an ordinary animal by judicious breeding brought as nigh perfection as possible. And this with no crossing, for there was no sheep suitable to cross with, but all the improvements have been effected by skilful breeding in the same flock with intelligent selection.

Anyone who wishes to improve his stock will have to make up his mind as to the kind of animals he intends to breed, and the breed best adapted to his farm. For when once started in founding or the improvement of a herd or a flock, we have seen changing about from one breed or even one strain to another is to ensure failure. I do not say it makes no difference what breed of cattle or strain of sheep a man adopts, but I do say that almost any breed can be improved by skilful breeding.

One of the most important elements in settling the kind of stock is the character of the veldt, the climate, but more especially the food supply. For it is a well-confirmed axiom of successful breeding that a good deal of the improvement goes in at the mouth; to wit, the great difference between a Shetland pony and a London dray-horse has been induced by the difference of food supply over long course of years.

They are both well proportioned, and active, and symmetrical, showing that harmony between the food supply and the horse has been established. The drayhorse belongs to a large breed of horses; but the colts are well fed from the day they are foaled. An opposite example is the case of breeding from tall and daintily-fed thorough-bred horses, and giving not only the mares in foal scanty diet, but the colts also; the result of which is an abundant crop of weeds.

For it must always be remembered that, we use our stock as a means of converting the produce of the veldt into

power, beef, mutton, milk and wool, &c. And then the adaptation of the internal economy of our animal machines to this purpose has a great deal to do with the success of our stock-breeding, and the ability or otherwise of an animal to work up the raw material of the veldt constitutes very much its value.

And recollecting that the powers of stomach, &c., are equally propagated by the sire as the dam, it is easy to see if the sire has been *spoon-fed*, that is, accustomed to quantities of easily digestible and nutritious food, his progeny will not be fitted to deal with coarser and scantier diet, which often tells on their size and condition. So that for one or two generations they get smaller and are not thrifty.

And this constitutes one of the chief advantages of using Australian rams, as they have been bred under very much the same condition; in fact, like removing the sheep from one South African farm to another.

Having made up our minds to the kind and proper style of animal for our veldt and purpose, the next thing is to select a few good ones of both sexes if possible, at all events a pure-bred sire, and then steadily breed from these without any crossing, and most religiously keeping to pure blood as far as possible, and always on one side at least, and with equal determination never to use your own or anyone else's *half-bred* sires, however promising or well-bred he may appear. Use the old bull till you have another pure-bred to take his place.

If larger animals are desired, this increase is not to be obtained by introducing large sires, but by increasing the creature comforts and food supply, and breeding from the larger animals of the herd or flock. This is the way the South-downs have been increased to their present size and quality. Raise the larger breed on the foundation of the harmony of your stock with your veldt.

But the time has arrived when I think the number or even the size of our stock is not the question; but the return per morgen; say, in the case of sheep, the amount of wool and mutton to the acre. And if three smaller sheep can be kept on the same area as two larger ones, would not there be a greater return and the greater prospect of increase? However, if larger animals are found best, they must have food supply accordingly.

With regard to the improvement of sheep, I think I cannot do better than give you the advantage of Ryre Graham's Australian experiences and advice. He says as to the improvement of a flock:—

"As a first step I would carefully class them into first,

second and third quality. From the first I would breed; from the second I would breed, provided the station was understocked, but I would take care that a distinguishing ear mark were put upon them and their lambs; the third lot should never be bred from, they should be fattened off and sold for what they would fetch.

"The best of the rams, if there are any really good ones, should be put with the No. 1 ewes. If there are no good rams they should be purchased from some well-known breeder, and a fair price paid for them; it is false economy to purchase inferior rams at any price. Although we keep No. 2 ewes and breed from them, it will be with a view to keeping them and their increase only till there is enough to stock the station with our No. 1 flock.

"When the first draft of your No. 1 ewes by the best rams you have purchased are about 20 months old, select 50 of the very best of the ewe lambs, and purchasing from the *same party* who supplied you with your first rams a very superior ram, put him to your 50 selected ewes. The 50 selected ewes will give you as progeny to the superior lamb at weaning time 20 to 22 ram lambs. From these select the very best one, and when the proper time arrives put him with his sire to the 50 aforesaid selected ewes and the 22 or so of his own age, provided the whole of the 22 ewe lambs are good; but should any of the 22 be inferior, in consequence of their dams throwing back, cull them out at once, and keep only such as are faultless or nearly so. By these means as the old rams give up you replace them with better stock, as the father of the young rams may be worth (say) £50 whilst the old ones cost (say) no more than £5 or £6 each. Thus, in the first instance, you buy better sheep than your own; consequently the first lambs that drop must be better than their mothers, and these again being put to a ram very much superior to either father or mother, must improve the flock rapidly.

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"If rams you must buy, buy them only from some flock that has been long established; and if you do not afterwards breed your own rams, continue to purchase from the *same breeder* so long as you own a sheep or the flock remains in existence."

Mr. Graham seems to have a great objection to flockmasters dodging about from one flock to another for rams; and no doubt his experience told him it was fatal to all improvement.

As to our herds and flocks of the future, I see no reason why they should not be improved to take rank alongside

those of other countries. We hear from men who have been to Australia that they do not consider there is much advantage of either climate or veldt in favour of stock-breeding in that country, and we know what they have done.

And as for England, France or Germany, it is difficult to see what advantages of climate *they* have, especially for breeding the merino sheep for this country. South Africa is more like Spain than either of those countries.

All that is required is steady and intelligent perseverance on lines and methods adopted by the great masters of this art; and then I think we may fully expect continuous improvement, and this not only in stud flocks and herds, but in the general stock of the country. I see no reason why we should not produce wool of a quality equal to anything now exhibiting, but cattle of a far better class. Even our newest domesticated stock is open to improvement, and in the future we may produce ostrich feathers of a quality never yet seen.

XV.

DISEASES OF THE LIVER IN SOME OF THE DOMESTIC ANIMALS IN THE COLONY.

BY D. HUTCHEON, *Veterinary Surgeon to the Colonial Government, Port Elizabeth.*

THE subject of my paper is: Diseases of the Liver of Some of the Domestic Animals in this Colony. The reasons which induced me to select this subject are:—(*a*) because "Gall-sickness" is such a very common complaint amongst all kinds of stock in this colony, and (*b*) so very little has hitherto been done to distinguish one form of Gall-sickness from another There is, perhaps, one exception to this rule, in that fatal form of the complaint which has received the somewhat expressive name of Black Gall-sickness. But beyond this, very little is known of the different causes, or distinguishing characters, of this very common complaint. Nor am I in a position to unravel the skein by associating each particular form of the complaint with its own specific cause. The most that I can attempt to do on the present occasion is, to open up the subject, and perhaps clear away some of the misconceptions which have hitherto obscured it.

I will commence, therefore, by giving a brief description of the structure of the liver, and the peculiarity of its blood supply, as an understanding of these will enable us the better to form a correct idea of the changes to which it is liable.

The liver is the largest gland of the body, and lies immediately between the diaphragm and the stomach, in the abdominal cavity. The liver, like all the other internal organs, is covered over with a very thin bluish-white membrane, called the serous membrane; this is easily stripped off; but after removing this outer covering you will find, on close examination, that there is another very fine fibrous covering which closely envelopes the whole organ. If you attempt to remove this thin covering you will find it somewhat difficult, and that when you do succeed in raising it up from the surface of the liver, it does not come away clean, portions of the liver substance remain attached to it. This

is due to the fact that this fine membrane not only covers the surface of the liver, but it also extends very fine partitions into it, forming the framework, as it were, of the organ. The divisions formed by this delicate membrane will be better understood if you make a clean section through the substance of the liver with a knife, and then carefully examine the cut surfaces: you will then observe that they present a granular appearance, the whole substance of the liver being composed of small polyhedric-shaped granulations.

These minute divisions may also be distinguished through the thin fibrous covering of the liver. Each of these divisions is a miniature liver in itself, and is called a lobule. The liver is thus composed of a mass of these little lobules, each of which is an exact counterpart of the others, held together by a very fine framework of fibrous tissue and vessels; somewhat similar to the manner in which the cells of a honeycomb are joined together.

In health, the substance of the liver has a bluish-brown or violet colour, the shades of which vary much according to the animals. But the principal clue to a proper understanding of the functions and morbid changes of the liver lies in the manner in which the blood vessels are distributed within the organ. The liver receives its blood supply from two sources. There is an arterial system, as well as a portal system of vessels. The arterial blood is carried to the liver by that vessel known as the hepatic artery. It passes into the liver at its posterior fissure along with the other vessels, and becomes broken up into several branches, whose ultimate divisions carry nutritive blood to the lobules of the liver. The liver thus, in common with every other organ of the body, derives its nourishment from arterial blood. The other source of supply, viz., the portal vein, whose branches are distributed within the organ exactly like the hepatic artery, does not contain arterial blood. The portal vein is made up of a number of vessels which collect the venous blood from the surfaces of the whole of the intestines, and stomach, and also from the spleen. But although the portal vein contains venous blood, it differs greatly from ordinary venous blood, as you will readily understand, for it contains certain portions of the food, viz., the *saccharine*, the *albuminous*, and other substances, which have undergone the necessary process of digestion and transformation, to render them capable of absorption by the numerous capillaries which ramify on the surface of the digestive canal, and which, together, form the veins which ultimately unite

to form the great portal vein. This is called the functional vessel of the liver, because it is from the blood supplied by the portal vein, that the liver manufactures its two principal secretions, viz., bile and sugar, and it is from this source also, that so many deleterious ingredients find their way to the liver so soon after being partaken of by the animal. Moreover, the portal blood circulates under very low pressure, The circulation within the liver is, therefore, very slow. One consequence is—that foreign substances suspended in the blood are very apt to be deposited in the liver (Ziegler), and just as certain normal constituents of the blood are transformed and secreted by the liver, so, also, abnormal substances circulating in the blood, may be taken up from it, and excreted by the same organ, very much to its own detriment. The liver, in fact, acts as a porter, or doorkeeper, to the circulation; all the substances which are absorbed by the blood vessels from the intestinal canal, having to pass through the portal vein and capillaries of the liver before they can enter the general circulation.

From the above it will be easily understood, how liable the liver is to become affected when any unwholesome food is eaten, or when rich food is partaken of in excessive quantities. Animals are generally credited with an instinctive knowledge of noxious plants, by which they are enabled, without experience, to avoid all that is hurtful to them; but, it is evident that, this instinctive faculty is very often at fault in this colony. What is more common, when removing stock from one district of the colony to another, than to find that a number fall sick, either on the journey, or immediately after arriving at their destination, from having eaten some poisonous plant with which they were not familiar? There are many examples of such, but I need only refer to the tendency of cattle to eat that well-known poisonous plant, the "Cape Tulp," and its rapidly fatal effects upon them. This plant not only causes acute inflammation of the stomach and bowels, but it exerts a powerfully depressing effect upon the general system; and in those cases which survive these first effects of the poison, acute inflammation of the liver immediately follows, with its attendants, blocking up of the bile ducts, and distention of the gall-bladder with thickened bile; while the fat throughout the body becomes as yellow as a guinea. But the liver is not only liable to suffer when noxious substances are taken in with the food, and pass with it into the portal circulation: the liver is also very liable to disease from an excessive ingestion of healthy food.

In fact active congestion of the liver is a natural accom-

paniment of healthy digestion, when a full meal has been partaken of. But when the food supplied is either excessive in quantity, or of too stimulating a character, this stage of active temporary congestion is apt to become chronic and to lead to disordered function. Rich stimulating food, insufficient exercise and hot weather are the three most common causes of liver disease in animals as well as in man. All over-fed animals are liable to disease of the liver. We are all more or less familiar with the fact that that great delicacy—a fatty degenerated goose liver—can be artificially produced, by fastening the goose up for a few weeks in a dark room and cramming it several times a day with fat-forming, starchy food.

All stall-fed animals which do not receive proper exercise, are more or less liable to repeated attacks of congestion of the liver, from over-feeding, especially in a warm climate like this. Many of these attacks may pass over with little or no notice, until some day the stage of congestion is passed, and acute inflammation supervenes, with all its attendant dangers, the animal barely escaping with its life.

From my limited experience in Port Elizabeth, I am not in a position to speak with too much confidence, but I am strongly of opinion that the form of liver disease, or gall sickness, which is prevalent amongst the milch cows here is largely due to errors of diet and over-feeding. But there are a great number of cases of liver disease, or gall-sickness, in this colony, in which animals affected manifest distinct symptoms of brain derangement, and that at a very early stage of the disease. A number of such cases are doubtless due to an arrest of the biliary functions of the liver, whereby the bile constituents are left in the blood, and cause derangement of the functions of the brain as they circulate with the blood through that organ; and many of us are doubtless familiar with the defective vision and giddiness of the head which accompany an acute bilious attack.

Further, a very common cause of acute convulsions in calves is the presence, in the first stomach, of numbers of hair balls, or quantities of rags, ropes, and other indigestible materials which calves are so liable to pick up. Still, independent of all these causes of brain disturbance, there is one form of liver disease seen mostly in the horse, but common enough amongst cattle, sheep and goats, in which the principal constant symptom is derangement of the functions of the brain, leading on to delirium, coma and death.

I have selected the horse from which to illustrate this

form of liver disease, not merely because the most typical examples of the disease are to be met with in that animal, but because this form of the disease itself has received more attention from colonial farmers, in connection with the horse, than with any other animal.

The disease, however, has been hitherto recognised under a different name, and has been attributed to a different cause. I refer to that very common disease of the horse, popularly known as—"bots." Whether "bots" do or do not kill horses in this colony, it is not my purpose here to discuss; of one thing I am certain, that the disease which I am about to describe, and which I have always heard attributed to "bots," has no connection with the presence of these larvæ in the stomach, but it is due entirely to a special form of disease of the liver.

The following are the symptoms of the disease to which I refer. The horse appears dull, lacking his ordinary energy, and feeds with a manifest dis-relish for his food. On turning up his eyelids their lining membrane will appear of a dirty-yellow colour, sometimes with brown spots or streaks in it. By-and-bye the horse becomes drowsy, stands or walks with his head depressed, and picks and eats in a very listless manner. In other cases the animal will appear uneasy, paws with his fore feet, bites at his sides, rubs himself against his companions, and manifests symptoms of abdominal pain. This is succeeded by delirium. The horse will wander about the yard or veldt in a most heedless and stupid manner, until, perfectly unconscious, he either tumbles down in a corner of the yard or into some sluit, where he dies.

In every case such as I have here described, I have found, on making a post-mortem examination, that the liver was the principal organ affected. Individual cases of this peculiar disease occur all over the colony, and at all seasons of the year, but it prevails as an epizootic amongst horses in certain districts only, and within those districts it is much more common on some farms than on others. Its time of greatest prevalence is during the months of January, February and March. But a very pertinent question may be asked here. How is it, considering that this disease of the horse is so common, and such a number of cases have been opened by the farmers year after year, that no one has hitherto observed the condition of the liver, if it is the principal organ affected in this disease? The answer to this is, I think, very simple. The horse has not got a gall-bladder, consequently there is no visible appearance of

anything being wrong with the liver, while the diseased condition of the liver itself would not be readily observed unless the dissector cut into it. On the other hand, "bots" are always present in the stomach, in greater or less abundance, while the anatomy of the horse's stomach is somewhat peculiar, and very misleading to an amateur anatomist; I am not surprised, therefore, that the mistake should be made—and persisted in—that this disease is due to "bots," and not to any affection of the liver.

A like mistake is daily made in the opposite direction, and from a similar cause—deceptive appearances. When the carcase of an animal having a gall-bladder, such as an ox, sheep, or goat, is opened, and those parts of the bowels which have been lying in close contact with the gall-bladder are found stained with the colouring matter of the bile, the conclusion is at once arrived at that the bile has either overflowed, or the gall-bladder has burst, when nothing of the kind has happened, and both liver and gall are perfectly normal. This staining of the bowels with bile has no pathological significance whatever, but is simply due to the ordinary property, which all liquids have, of passing through thin animal membranes, called *Osmosis*. In fact the more healthy the liver, and the more fluid the bile in the gall-bladder is, the more readily will it transude through the walls of the gall-bladder, and stain the textures in contact with it.

This is a digression, but I wanted to point out how deceptive appearances sometimes are; and that, although popular opinion in such matters should not be lightly set aside, when that opinion is based upon wrong conceptions of what is seen, it becomes the greatest obstacle to real progress, and requires correction.

But to return to the cause of this particular form of liver disease in the horse. Mr. Wiltshire, Colonial Veterinary Surgeon of Natal, and some others, consider that the disease is only a modified form of horse-sickness, and that it is closely related to Anthrax, or what we term "Melt Ziekte," in this colony.

Now, I am prepared to admit that it may bear some relationship to horse-sickness, inasmuch as it occurs at the same time of the year when horse-sickness is most common, while some of the *post mortem* appearances are similar to those found in horse-sickness, but I am fully persuaded that it bears no relationship to Anthrax.

There is, however, undoubtedly something special about it. The constant symptom of brain disturbance, and the virulent character of the disease ordinarily, clearly indicate

that it is something more than common congestion or inflammation of the liver. As Dr. Darley says:—"At one time it puzzled me, as it must have done everyone else who has cast a thought on the subject, why—if the theory of bile-poisoning being the cause of the cerebral symptoms in cases of jaundice be correct—it so frequently happens that while cerebral and other nerve symptoms supervene in a few days, or even hours, after the commencement of the attack, in certain other cases of jaundice from obstruction, where not only the blood, but every tissue in the body—judging from the prolonged duration of the attack and the depth of the discoloration of the skin and urine—must have been saturated with the constituents of the bile for many weeks, not a vestige of nerve derangement is perceptible; beyond the mere symptoms of prostration and cerebral exhaustion, which are common to all cases of disease associated with mal-nutrition of the nervous system. A knowledge of these facts drove me to search for some other assignable cause of the presence of head-symptoms in certain cases of acute jaundice, and it was a long time before I could satisfactorily to myself, account for them. Now, however, I think that I have obtained a scientific and logical solution to the problem, which is this:—In all cases of jaundice, where cerebral symptoms rapidly supervene, the *fons et origo* of the morbid state inducing it may be said to be germs. Thus, the cerebral symptoms supervene, very rapidly in acute atrophy of the liver, in contagious jaundice (yellow fever), and tolerably speedily in severe cases of malarial and paludal jaundice. All of which, as I have already, I think, conclusively shown, are due to pathogenic germs. . . . . All physiologists are agreed that cerebral symptoms and spinal nerve disorders, drowsiness, delirium, coma, convulsions and paralysis of a particularly well-marked character, follow the artificial introduction into the healthy animal body of both physiological and pathological forms of toxic germs."

Further, he believes that the manner in which the germs produce the brain symptoms is by depriving the brain substance of a sufficient amount of oxygen. Most disease germs require oxygen for their development and multiplication, and when they multiply within the circulating blood, as many of them do, they withdraw from it the oxygen, which is indispensable for the healthy nourishment of the various tissues of the body. The withdrawal of oxygen and other nutriment is not, however, the only result; it is seldom even the most important. Investigations show that

the vital activity of the bacteria of necessity sets up extensive chemical changes in their own nutrient materials. In the course of these changes matters are produced, which act as poison upon the system. This effect of the bacteria on their nutrient fluids, and the production of poisonous matters, have much more to do with the origination of the symptoms in most of the microparasitic affections than has the mere withdrawal of nutriment (Ziegler).

It will be readily admitted that, in the particular disease of the horse now under discussion, we have the whole series of symptoms which are observed to follow the introduction of disease germs into the system, viz.: drowsiness, delirium, and complete insensibility.

But for additional proof with respect to this, let us refer for a little to the symptoms manifested in one or two diseases which are now known to be due to the introduction of certain specific germs into the system of the animal. Let us take, as one example, that disease of fowls which is so common in many districts of this colony, and which is known by the name of "Fowl Cholera" in France. The symptoms manifested in this disease are: the bird is observed to be dull and sleepy, and to sit constantly in a crouching position on the perch; diarrhœa is present, and the excrement has a dirty yellow appearance; death may occur without a struggle, but frequently the bird has convulsions, and utters loud cries while dying; the comb will be noticed to assume a dull, dark-blue colour.

Here, then, is a disease which Pasteur and others have satisfactorily proved to be due to the introduction of certain specific germs. These multiply rapidly within the blood, producing the symptoms already described, and certain pathological changes, the most noticeable amongst which is that the liver is enlarged to about three times its normal size, and has a dark, purplish colour. It is a contagious disease, the contagion being contained principally in the excrement of the sick birds. To avoid contamination through this means, you must either remove every sick bird as soon as it is observed to be sick, and keep your poultry yard scrupulously clean, or what is better, remove all your healthy birds at once to new ground.

But my principal object in referring to "Fowl Cholera" in this place is to point out the similarity of the symptoms manifested in this disease, known to be caused by disease germs, and the symptoms exhibited by a horse when suffering from that form of gall-sickness now under discussion.

Let us, however, take another example. Most of you will have heard of, if not seen, that disease of cattle which is known by the name of "Red-water," which has unfortunately got a firm footing in the Kaffrarian districts of the colony. Now, although there may still be some difference of opinion respecting the particular germ which is the originating cause of this disease, there is little difference of opinion amongst those who have studied the disease that it is due to some minute organism. Further, that this organism, whatever it is, is conveyed to healthy pastures by affected cattle; that it is capable of living, multiplying and undergoing certain processes of development in that pasture, and such a pasture becomes thereby contaminated and capable of communicating the disease to healthy cattle which subsequently graze there. Let us, therefore, compare the symptoms manifested in this disease (red-water) with those exhibited by the horse when suffering from this form of liver affection, which we are discussing, and you will observe that they bear a very close resemblance to each other. The following description of the symptoms of red-water is taken from the Red-water Commission's Report:—The beast, when first observed, appears dull and sluggish, with a tendency to leave the rest of the herd, the hair stands erect, like that of an animal in a cold day (a staring coat); the ears hang and the eyes have a dull and lustreless appearance. In some cases the beasts will cease feeding, in other cases they continue to nibble at the herbage until nearly the last, but in an indifferent manner, indicating that they have no real relish for their food. There is a dribbling of saliva from the mouth. Later on the animal will manifest a disinclination to move, and when compelled to do so, will walk with a dragging, straddling gait, as if weak across the loins. In some cases, where the sick beast is left undisturbed, it will remain almost constantly in one place, and while standing with head depressed and ears hanging, in a drowsy, semi-comatose condition, look the very picture of complete nervous prostration. The most characteristic symptom of "red-water," of course, is the claret colour of the urine, from which the disease has received its name; but this peculiarity in the colour of the urine has been observed by myself in the similar affection of the horse. Further, one of the principal organs affected in red-water in cattle is the liver; in fact, so prominent are the altered conditions of the liver and of the bile in the gall-bladder, that many men of experience insist that red-water in cattle is nothing more than "black gall-sickness." In arriving at this conclusion,

farmers fall into the common error of mistaking the effect for the cause, through being guided by the appearance of certain organs only. This dark and inspissated condition of the bile, although frequently met with in cases of red-water, is by no means constant in that disease, neither does it constitute a distinct variety of gall-sickness, as is generally believed. This thickened and tarry condition of the bile appears to depend upon the particular character of the inflammation of the liver, or rather the manner in which the inflammation extends to the liver.

The most common cause of black gall-sickness is the ingestion by the animal of some noxious and irritating substance, which we will call a plant; this sets up irritation and inflammation of the stomach and bowels. This inflammation extends from the bowels up the common bile duct to the gall-bladder, thence up the various biliary channels, which ramify through the liver. The effect of this inflammation of the bile ducts is to cause the secretion of a thickened mucus from the membrane lining them. This mucus not only increases the consistency of the bile, but it tends to close up the bile ducts themselves, so that the fluid portion of the bile only escapes through the narrowed channels. The effect of all this is engorgement of the bile ducts, and distension of the gall-bladder with thickened bile.

You will readily perceive, therefore, that "black gall-sickness," or, more properly speaking, inflammation of the bile ducts of the liver, may occur in varying degrees of intensity, depending upon the amount or virulency of the exciting cause. For instance, if the irritant be a virulent poison, similar to tulp, you will have the inflammatory action rapidly extending throughout the whole of the biliary canals of the liver, with a correspondingly rapid secretion of thickened mucus from their surfaces, resulting in complete engorgement of the bile ducts and gall-bladder with dark inspissated bile. Or, the irritant may be of a less virulent character, or a smaller amount of it may have been eaten, hence the inflammatory action may extend no further than the common bile duct leading from the intestine to the gall-bladder, and causing only a temporary stoppage to the flow of bile. Anything, therefore, which causes inflammation of the upper part of the bowels—the duodenum—has a tendency also to induce inflammation of the bile ducts, and this invariably leads to a greater or less thickening of the bile. The more virulent the irritant the blacker and thicker will be the bile, and the greater the tendency to a fatal

termination. It is the milder cases which recover, and the virulent cases which die, and are examined. Hence we have come to consider "black gall-sickness" as a distinct form of liver disease, and not what it really is—a more intense variety of a very common complaint.

The reason why it is such a common accompaniment of fatal cases of red-water is, because in that disease there is generally a congested condition of the mucous membrane lining the bowls, as well as a deranged condition of the liver itself, which will easily explain it. But, as I have already stated, the diseased condition of the liver, the altered character of the bile, and the yellow colour of the fat throughout the body, seen in cases of red-water, are not due to a common vegetable irritant, such as tulp.

These common vegetable irritants produce their virulent effects within a very limited time after their ingestion. It is not so with the irritant, which induces all the pathological changes observed in red-water. The organism, or germ, which is the originating cause of this disease, requires a certain time to develope its full pathological force, after it enters the animal system. This latent period has been called the period of incubation, or time which the disease germs take to hatch. Each specific disease requires a special period peculiar to itself, differing from others; just as different seeds require different periods to germinate. This is a characteristic feature of specific infective diseases, that they remain latent for a definite time before the symptoms develope, and run a typical and special course after the symptoms appear. In red-water, the latent period is, ordinarily, about fourteen days, while the course of the disease is ordinarily about four days.

It will be observed that I am not attempting here to give a full description of red-water; my object is mainly to show how liable the liver is to become affected, and its biliary function to be interfered with or suppressed by a variety of causes, not the least important amongst which are specific irritants, or disease germs. And further, to point out that these minute agents play a very important part in the causation of disease amongst stock in this colony.

It may be said, and with some truth, that the tendency amongst pathologists at the present time is to attribute all diseases of an obscure and fatal character to the action of certain kinds of germs, and to consider that when they have relegated them to that class, they have solved the problem. The generally accepted hypothesis is, that all or most infective diseases (other than those due to animal

parasites) are caused by the development of bacteria in some tissue or fluid of the body, and that each specific form of disease has a specific bacterium (Ziegler). We are unfortunately familiar with several diseases of stock in this colony, which are of that specific character, some of which are known to be due to the specific forms of bacteria, and several others which are more than suspected to have that origin. I have already mentioned two—fowl cholera and red-water. There are other two equally common, whose origin is even better known, viz., "melt ziekte" and "spon ziekte." Except it be fowl cholera, none of these diseases is communicated direct from an affected to a healthy animal. The poison, in such cases, is passed by the affected animal to the soil or veldt, from which healthy animals subsequently pick it up with their food or water. Immediate change of veldt will at once arrest the spread of these diseases, even although affected animals may be removed along with the others.

There are other diseases of stock, however, which, although the germs which are believed to be their originating cause, have not been isolated or identified, manifest all the characters of specific diseases, and are doubtless due to some specific cause. Take "horse-sickness": it is well-known to most farmers, that certain atmospheric conditions are the most important factors in the production of that disease; and that, although it favours certain localities more than others, it may not manifest itself even in these localities for several years in succession; while, in other years, it may prevail over the greater part of the colony. Here we have a disease, which is so uniform in its course and character, that anyone who has once seen a typical case, can never mistake it for anything else. The appearances may be a little modified by certain circumstances, but they are essentially alike, just as certain crops are modified by the conditions associated with their growth, but they are identical with the seed sown nevertheless.

We conclude, therefore, that horse-sickness is caused by some definite and specific virus, which springs into active life under the influence of certain conditions of the atmosphere. The effect being always the same, the cause producing it must also be the same.

There is a common disease of sheep, which manifests peculiarities similar to horse-sickness, termed "fever," "bek-ziekte," "blauw-tong," or "epizootic catarrh." This is undoubtedly catarrhal fever of a specific type or character, and its cause is just as certainly associated with the night

air or dew. It prevails only during the summer months, and many of the higher districts are exempt from it. Sheep kept in proper sheds escape from it, while those which are kraaled on elevated situations, are less liable to become affected. But although the night air or dew is the essential condition associated with the development of this disease, the active agent itself must be something distinct from the dew, although the dew is essential to its development. This is proved, I think, by the fact that the disease has largely extended its area since its first appearance in the colony.

There is yet another disease in sheep, which manifests this peculiarity in a more marked degree: I refer to the disease known as the "Heart-water." All stock farmers on the coast are, unfortunately, familiar with this disease. Let us, then, consider for a moment, how it has been spread. It is believed to have made its appearance first in the Chalumna district, from which it extended through the divisions of King William's Town, East London and Komgha, on the one side; and through the divisions of Peddie, Victoria East, Fort Beaufort, Albany, Bathurst, Alexandria and Uitenhage, on the other. Like the disease already mentioned, heart-water is not communicated direct from an affected to a healthy animal. There is, however, ample evidence to show that affected sheep communicate something to the pasture, from which healthy sheep which graze over the same pasture subsequently contract the disease. Much has been written, and many arguments used, to associate the origin and spread of this disease with over-stocking and deterioration of veldt. But while I readily admit the evils arising from over-stocking, and its necessary attendant, deterioration of veldt, I consider these but secondary influences in the production of either heart-water or fever; or in fact any of the diseases which I have mentioned.

But the point which I want to arrive at is: Have we any evidence of a similar character, with respect to the origin and spread of certain forms of gall-sickness? I think we have. And in support of this I will adduce the testimony of an observant farmer of large experience, which some of you will know: I refer to Mr. D. E. Hobson, late of Paardefontein, in the division of Jansenville. He stated in a letter to me three years ago: "Twenty-six years ago gall-sickness was not known on the farms of Messrs. J. Crose, Faure and Pretorius, nor on Rattler's Kloof, up as far as Hopewell, eighteen miles from Graaff-Reinet, in all six or seven farms. About twenty years ago the new main road was made through these farms, and hundreds of transport oxen were

continually grazing along the road. Gall-sickness very soon became so bad, that on five of these farms no goats would live. About 1874 or '75 the Jansenville bridge was finished, and the road was turned several miles to the west of three of these farms, and on these three farms goats now do well: seldom a case. On my farm, Rattler's Kloof, a lot of transport oxen belonging to my tenants used to graze, and the matter became so serious that I turned off my tenants. For two years after the goats died, so that the ground was perfectly useless to me; now it is all right. My opinion," says Mr. Hobson, "is, that in our district, if transport oxen coming up from Uitenhage and coast districts, are allowed to graze on our veldt, goats will not live. It would appear that the cause of the disease is something brought up with the oxen from the coast districts."

Here, then, we have distinct evidence that certain forms of gall-sickness can be spread by certain animals. And it is not always necessary that the animal which is the active medium of spreading the disease should itself manifest any visible signs of being affected. We have evidence which clearly shows that an ox or cow not itself visibly affected with the disease termed red-water, but coming direct from pasturage which is known to be contaminated with the propagating germ of that disease, can communicate that active and generating agent to healthy pasture, and so spread the disease.

I trust, therefore, that I have said enough to convey to you an intelligible idea that the term "gall-sickness," as applied to the diseases affecting the livers of our domestic animals, must necessarily cover a very wide field; that the causes of these complaints are various, some very obscure; and that the treatment of these affections must be equally different, corresponding to the different agencies at work.

It would be perfectly useless to treat the gall-sickness which prevails amongst the milch cows of Port Elizabeth, and stall-fed animals generally, with many of the remedies which are found effectual in certain forms of gall-sickness prevalent in different districts of the colony. As already stated, animals that are stall-fed suffer generally from acute congestion, running on to inflammation of the liver, due either to the food being too rich or in too great abundance. In such cases an active purgative, in the first stages, is a *sine qua non* to successful treatment. On the other hand, many of the cases of so-called gall-sickness which animals contract while grazing on portions of veldt new and strange to them, or on the same veldt under certain peculiar

conditions, are neither more nor less than varying degrees of irritation and inflammation of the stomach and bowels, caused by some irritant which the animals have eaten. In the treatment of such cases, respect must be had to the exciting cause, and its special effects in each particular instance. In the human subject, and in such domestic animals as the dog and cat, when an irritant poison enters the stomach, it generally gives rise to vomiting, by which a considerable portion of the poison is very often ejected. In the majority of cases, however, even in them a certain portion of the irritant passes from the stomach into the intestines, and induces purging as well as vomiting. As it is very difficult to induce vomiting in any of the herbivorous domestics, this symptom is absent in them. The first observable indications generally are a looseness of the bowels, accompanied by signs of pain and irritation; the tail being pressed against the anus, and moved in an irritable manner from side to side while the *fæces* are being passed. In the treatment of such cases in our herbivorous patients the veterinary attendant is deprived of one effective agent which the human physician can always command, viz., an emetic. He is, therefore, compelled to fall back upon remedies which tend to counteract the action of the poison or modify its physiological effects. It is in the treatment of such cases where decoctions of the various gall-bushes are found so effectual, and such remedies as vinegar and salt, tobacco and salt, camphor and brandy, lime-water and linseed oil, lime-water, aloes and tobacco, coffee and chicory, &c., effect cures. It is very probable that the disease assumes certain modifications in different districts, due to a corresponding difference in the originating or exciting cause. This has led to the adoption of certain favourite remedies by the farmers of each district, which experience has shown to be more effective than others.

The mistake which is frequently made, however, is to consider that all cases of so-called gall-sickness are identical, and that the same remedy will act as a specific in the treatment of every case.

A little thoughtful reflection will show the fallacy of entertaining such an opinion. Every intelligent farmer must have observed that, the cases which occur amongst his own cattle, even on the same farm, are seldom alike. Modifications are certain to occur, even in the same animal, by such influences as the quantity of the deleterious agent eaten, and the condition of the system of the animal at the time.

It is such complications as these which make it impossible to prescribe a remedy which shall be equally effective in all cases; and it is equally impossible, even for a practised eye, to detect all those differences and modifications which constantly occur, by an examination of the patient conducted at a distance of six yards, which is the only method of examination practicable in the majority of cases which occur amongst the herds of cattle in this colony.*

Treatment in Certain Cases.

As the gentlemen who took part in the discussion which followed the reading of the paper, expressed a wish that I should add some directions respecting the treatment of the various forms of gall-sickness to which I refer in the paper, I have endeavoured to comply with their request.

It must be clearly understood, however, that it is impossible for me to do more than give *general directions*, and further, that the medicines which I recommend are those only which I have found most successful in my own hands; and are not meant to be substituted for any other remedies which experienced men have found successful in their practice.

First.—With respect to the treatment of that form of gall-sickness which occurs most frequently amongst the milch cows of our towns, and stall-fed animals generally; the characteristics of which are acute congestion of the liver, running rapidly on to inflammation.

The most prominent symptoms of this form of gall-sickness are—in the first stages—a dull and listless appearance, with a fullness of the abdomen disproportionate to the amount of food eaten. The animal may continue to eat, and even chew the cud at intervals, but the food partaken of is eaten with manifest disrelish.

The muzzle is generally dry during the acute stage, but I have often seen it moist during the whole course of the attack; it cannot therefore be relied upon as an indication of the severity or otherwise of the attack. The bowels may be a little looser in the early stages of the attack; this is, however, soon followed by constipation; the dung being dry and covered with mucus. As the disease advances, the appetite fails, and the animal ceases to chew the cud. Indications of pain now becomes manifest, the animal will

* At the conclusion of the lecture certain points therein were discussed, and wishes expressed respecting them; hence the reference in Mr. Hutcheon's next paragraph, and the therapeutic notes that follow it.—Editor.

appear uneasy, look round at its side, if lying will often press its muzzle against the seat of the liver, breathing becomes quickened, and often accompanied by a slight grunt or moan. Pain will be evinced when pressure is applied against the floating ribs, on the right side. A cough will also be heard frequently—which, together with the moan and quickened breathing, may lead to its being mistaken for lung-sickness. The grunt is not so pronounced, however, as in lung-sickness, neither is the head and nose protruded as in that disease. The pulse will average about ninety beats per minute, the normal pulse of healthy, full grown cattle being about fifty. Brain symptoms will often supervene, the animal will keep moving its jaws, lips and tongue, as if eating; or will eat up gravel or keep chewing some piece of stick or rope that may be in front of it, and appear quite delirious.

The successful treatment of this form of liver disease or gall-sickness greatly depends upon an early recognition of the disease, and a prompt administration of medicine. As soon, therefore, as you observe the animal amiss, give:—

Calomel .. .. 60 grains.

Open the animal's mouth, pull forward the tongue, and place your calomel well back, you may then wash it down with a little cold water.

From four to six hours after give:—

Epsom Salts	1 pound,
Brown Sugar or Treacle	1 to 2 pounds,
Powdered Ginger	1 ounce,

mix and dissolve in about three bottlesful of hot water.

There are, of course, many cases of simple indigestion, where the animal will look a little dull and show a disinclination for food, which a simple dose of purgative medicine, such as a pound of Epsom salts, will restore to health directly. But where the symptoms of the liver being affected, are at all pronounced, I prefer giving a full dose of calomel before administering the purgative. Many distinguished veterinarians have objected to the administration of calomel in affections of the liver. Youatt says:—"Calomel should rarely be given to cattle, and never as a purgative." Williams says:—"That in the treatment of congestion of the liver due to engorgement with bile arising from inflammation of the mucous membrane of the bile ducts, by which their calibre becomes diminished, and the flow of bile consequently arrested, the administration of the so-called liver stimulants, as calomel is contra-indicated, for the

reason that the *secretory* powers of the gland are not interfered with, but that it is incapable of discharging the secreted bile, owing to the tumidity or swollen condition of the lining membrane of the small bile ducts."

The objection to the use of calomel in active congestion of the liver is, however, based largely on the commonly accepted opinion, that calomel *stimulates* the liver to an *increased secretion* of bile—whereas it appears rather to diminish than increase the actual secretion of bile (Lauder Brunton); its special action being to *expel* the *already formed* bile from the distended gall-bladder and engorged bile ducts. "The sudden expulsion of the accumulated bile from the gall-bladder being due to the stimulating effect of the calomel on the peristaltic action of the duodenum. Its irritative or, physiologically speaking, stimulative effects being communicated, by reflex nervous action, along the bile duct to the gall-bladder, and thereby exciting to immediate contraction its muscular coat; by which contraction the biliary contents of the viscus are suddenly expelled into the intestines, and give origin to the tarry, bilious stools." (Harley.) The same authority further states that: "in certain cases of diseased liver, where the biliary secretion is retarded or even arrested, in consequence of a congested condition of the tissues of the liver, mercury has a powerful, though only an indirect, effect in restoring the biliary secretion; not alone in the human, but equally so in the canine, bovine and equine species. And this it does, I believe, by means of its antiphlogistic action upon the hepatic capillaries. By subduing, if not indirectly actually removing, the congested condition of the blood vessels, it relieves the secreting structures from the mechanical pressure arising from the congestion of the blood vessels, which prevents the hepatic cells from secreting bile."

In practice I have never once regretted the administration of calomel in acute congestion or inflammation of the liver, but I have frequently had reason to regret that I did not administer it at an early stage of the attack.

In such cases I have often found the symptoms very much aggravated by the administration of a strong saline purgative alone; the bowels would be acting freely, while the indications of pain and inflammation were becoming more intensified. At such a stage a large dose of calomel, administered alone, has often produced a marked improvement in the symptoms within a few hours.

When indications of inflammation of the liver manifest

themselves, by uneasiness, quickened breathing, moaning, &c., considerable relief is obtained by wrapping a blanket or sacks firmly around the body, and applying hot water for an hour or two. When once you get the blanket or sacks thoroughly wet, a little hot water, poured gently on to the back, will run down both sides and around the abdomen. Apply the water just as hot as you can bear your hand in it. After fomenting the body well in this manner, take off the wet wraps, dry down the body gently, then mix up half a pound of mustard into a thick paste and rub it gently on to both sides of the abdomen opposite the seat of the liver. Put a piece of newspaper over the mustard, and place a dry rug or some dry sacks over all. This will keep up the surface circulation and tend to relieve the internal congestion. You cannot foment too long or too often in cases of acute pain and inflammation.

When brain symptoms supervene I have found the following dose very effective :—

Chloride of Ammonia	1½ ounce.
Extract of Belladonna	1 drachm.

Dissolve in a pint of boiling water, and administer when sufficiently cool. Repeat the above dose every three hours until the delirium disappears. Seldom more than two or three doses are necessary.

Should violent diarrhœa be present, accompanied by pain and depression induced either by a drastic purgative or by some irritant plant which may have been eaten, administer the following:—

Calomel	1 drachm.
Powdered Opium	1 do.

Mix the powders together, and either place them dry in the mouth and wash them down with a little water, or mix them in a little gruel. Take care that the calomel does not sink to the bottom and remain in the bottle.

Now with respect to that form of gall-sickness, in which the bile is found black and tarry-looking, due to inflammation of the bile ducts of the liver, generally known by the name of "black gall-sickness," the most common cause of this variety of gall-sickness is—the ingestion by the animal of some noxious and irritating substance of a vegetable nature; which sets up inflammation of the stomach and bowels. This inflammation extends up the bile ducts, inducing a secretion of thickened mucus from their lining membrane, thereby increasing the consistency of the bile, &c., as already mentioned.

In this form of gall-sickness the symptoms manifest themselves suddenly, and are characterised by severity from the commencement. There are clear indications of pain and nervous prostration throughout the attack. In the first stages if there is not actual diarrhoea, there is evidence of considerable irritation of the bowels. The animal will be observed to pass small portions of dung frequently. Subsequently the dung becomes of a brownish colour, and mixed with bloody mucus. By-and-bye nervous excitement appears. If the animal is compelled to move, it will lift the fore legs unnaturally and manifest a tendency to push its head into a corner. When these symptoms become pronounced, death soon puts an end to the scene.

In the treatment of such a case as this, violent purgatives must be avoided, on account of the inflamed condition of the stomach and bowels. I have found the best success, in such cases, from the administration, first, of :—

Calomel	.. ..	60 grains

After a few hours I administered the following :—

Raw Linseed Oil	.. ..	1 quart bottle full.
Lime Water	.. ..	1 do. do.

To be well shaken together.

The *lime* water moves the bowels well after the calomel, and at the same time allays the irritation and acid condition of the intestines which are present.

As already stated, if the cause is some very noxious irritant, producing acute inflammation and purging, I give the *calomel* and opium without a purgative, although lime water alone is an excellent remedy under such circumstances. Decoctions of the *wild dagga* and tobacco are also very serviceable in this form of gall-sickness.

When brain symptoms supervene, administer the chloride of ammonia as already directed, adding either belladonna, wild dagga, or tobacco.

In severe cases in which, although the acute stage is passed, recovery is very protracted ; the appetite remaining fickle and the bowels irregular, indicating a feeble and sluggish condition of the liver, I give :—

Powdered Podophyllum Resin	.. ..	½ drachm.
" Gentian Root	.. .. ..	½ ounce.
" Sulphate of Soda (Glauber's Salts)		2 ounces.

Mix and dissolve in a bottle of hot water or gruel and administer daily for a few days.

With respect to the administration of gruel, in cases

where the appetite is lost, one bottle or two of linseed or oatmeal gruel, containing a stimulant such as two or three glasses full of brandy or three drachms of powdered carbonate of ammonia, administered twice a day, will do much good, and assist in restoring the appetite, while it supports the strength. But the practice of forcing a large quantity of gruel down an animal's throat under such circumstances cannot be too strongly condemned. It must be remembered that it is not the amount of food eaten, but the amount digested, which supports the system. To force a quantity of food on a weak stomach, therefore, defeats the very object aimed at, for it is not digested, and consequently remains as an irritant and further depressant.

There is a form of so-called gall-sickness which occurs in calves, characterized by the sudden development of nervous excitement, convulsions, &c., generally termed "Dronk Ziekte." Very often the first indication of anything being amiss with the calf is seeing it in a convulsive fit. In some instances it never rallies from the fit, but dies in from half-an-hour to an hour. In many other cases, however, it will recover from the fit, commence to pick and eat, and even chew the cud, but very often repeated fits supervene, ultimately carrying off the little animal.

The cause of this sudden attack of convulsions is not always the same. In some cases it is due to the presence in the stomach of a number of hair balls, or rags, ropes, paper, or other indigestible materials which the calves pick up. In other cases I have observed the liver very much inflamed. In all cases where inflammation of the liver has been present, the calf has lived two or more days, and has had alternate fits and recoveries during that period.

TREATMENT.—While the calf is in the fit, it is difficult and dangerous to administer any medicine; great care must therefore be exercised. Give very slowly the following :—

Powdered Camphor	½ drachm.
Brandy ..	about two wine-glasses full.

Dissolve the camphor in the brandy.

After the fit is over give *calomel* 10 *grains*, and a few hours after administer the following :—

Epsom Salts	2 to 3 ounces.
Powdered Ginger	1 drachm.
Treacle or Brown Sugar ..	Table-spoon full.

The quantities, of course, depending on the age and size of the calf.

If the nervous excitement should re-appear, give :—

Chloride of Ammonia	..	1 to 2 drachms.
Extract of Belladonna	..	10 to 15 grains.

Dissolve in boiling water, administer when sufficiently cool ; repeat, if necessary, in three or four hours.

In many cases of acute congestion or inflammation of the liver in cattle, symptoms of lameness or stiffness in the right fore leg will often be observed, giving rise to the suspicion that the animal has been hurt about the shoulder. In other cases there is an appearance of paralysis. The animal will, at first, exhibit a slight weakness and want of steadiness in the hind quarters, most noticeable when turning. This weakness increases until the animal becomes unable to get up without assistance, and finally becomes unable to stand when raised. The bowels do not respond to strong purgatives, although their contents are perfectly fluid. Such cases as these are often confounded with another disease termed *Lam ziekte*, more especially as they very frequently occur in the same herd, at the same time, and in fact may exist together in the same animal. This last statement may require a little explanation. In those districts where *lam ziekte* is prevalent, it has been remarked by the farmers that there are two distinct varieties of that peculiar disease.

In the variety which is most common, the animal, while lying, manifests no particular pain or constitutional disturbance; the pulse, breathing and temperature will be little altered. The animal will eat and drink up to a little before its death, if food and water are supplied to it. Such a case may live from eight to twenty days, if attended to.

This is the simple form of *lam ziekte* due to paralysis, arising from a deficiency of phosphates in the food.

In the other variety of this complaint, the animal will manifest all the usual indications of derangement of the digestive organs, or gall-sickness—such as dullness, loss of appetite, pain, quickened breathing, often moaning or grunting previous to death. Such cases only last for a few days, as a rule, after they lie down. The *post mortem* examination generally reveals a congested condition of the liver, distension of the gall-bladder with more or less thickened bile, and a dry, impacted condition of the *blaar pens* or leaf stomach.

If such cases occurred in another locality, where *lam ziekte* did not prevail, they would doubtless assume the form of ordinary gall-sickness, and prove amenable to the usual

remedies for that complaint. But where derangement of the digestive organs, and congestion of the liver, occur in an animal already pre-disposed to *lam ziekte*, complete prostration and paralysis, both motor and functional, are the immediate effects.

Medicines which would readily operate under different conditions have no effect in such cases, after the paralysis is established.

Treatment in such cases must be prompt and active. As soon as the animal is observed to be dull and weak, or stiff-looking, or showing an inclination to lie down, when the others are feeding, administer at once:—

Calomel	1 drachm.

And in an hour or two afterwards—for there is no time for delay—give the following dose:—

Epsom Salts	1 to 2 pounds.
Treacle, or Brown Sugar ..	2 do.
Ginger (powdered)	1 ounce.

Dissolve the above in about six quart bottles full of hot water. The more water and sugar you administer in such cases as these the better; they will hasten the action of your medicine, and assist in moistening the dry food in the *blaar pens*. It is necessary, however, to remember that when the *blaar pens* is dry and firmly impacted a great portion of the medicine may pass through the channel of that stomach without penetrating between its leaves; and that it is to the *frequent* passage of fluids rather than to the *rapid* passage of a *quantity* that you must depend upon to keep the contents of this stomach moist.

For that reason administer every three hours a few bottles full of warm water; a little sugar and a handful of oatmeal added to it will be of advantage.

In this complaint, unless you can get your purgative medicine to act before the animal lies down, it is rare that it operates after paralysis has been established.

Not many months ago I was requested to examine a cow which was taken suddenly ill while grazing on the veldt. She was unable to follow the others home that evening, and when the owner went to bring her home the following morning, he found her lying, unable to get up or to stand when lifted. Ultimately he had her carried home in a cart. I saw her the same morning about ten o'clock.

There was great nervous prostration, associated with tremulous excitement. The cow was in a delirious condition, and quite unable to raise even her fore-quarters. There

was violent purging, the *fæces* being quite watery. It was a very puzzling case. It was evident, however, that the cow had eaten some noxious substance of an irritating and depressing character.

I administered the following dose at once:—

Chloride of Ammonia	.. ..	1½ ounce.
Extract of Belladonna	.. ..	1 drachm.

Dissolved in a bottle of warm water. This dose was repeated every four hours until four doses had been administered. By this time the purging had ceased, the nervous excitement and paralysis had nearly disappeared. She could get up, walk about the box, and feed a little. I then gave her a bottle of raw linseed oil, as the bowels showed a tendency to constipation, which is very common after such violent purging as took place in this case. The cow after this got rapidly well.

It would be manifestly impossible, however, to give definite directions for the treatment of every variety of such cases that are constantly occurring, and absurd to imagine that any one medicine can be equally suitable for every form of disease of the liver and digestive organs. I have only been able to indicate the general method of treatment which should be adopted in the most common forms of these complaints. Varieties and complications will constantly occur, which no fixed rule or directions could possibly meet.

Considering the isolated position which the farmers of this colony occupy, and the absence generally of facilities for procuring special articles such as medicines, I have been surprised that such a small number of them take the precaution of keeping a few simple remedies always in stock, to meet any cases of emergency.

Many a good horse has been lost by gripes or inflammation of the bowels, when the timely administration of a quart bottle full of raw linseed oil, and one to two ounces of laudanum, would have saved him.

In the same way, many a beast has been lost for want of proper attention, there being nothing about the place but paraffine, tobacco, or common salt to give him.

Every farmer ought to have a small scale with weights, a graduated measure glass, with such medicines as Epsom salts, raw linseed oil, carbonate of ammonia, chloride of ammonia, sulphur, sulphate of iron, calomel, laudanum, belladonna, turpentine, saltpetre, sulphate of copper, powdered ginger, gentian, &c.

Further, it must never be forgotten, that although medi-

cines, when judiciously administered, can accomplish a great deal in warding off the tendency to death, and maintaining and sustaining life, until the disease from which the patient is suffering has run its course; they can only effect these objects where proper care is taken of the animals when under treatment.

Many farmers refrain from putting a sick animal into a house or shed, because they have no artificially prepared food of any kind to give it. They consider it the least of two evils to allow such an animal to remain on the veldt and, forage for itself.

Now this is a very great mistake; shelter and comfort are far more essential to a sick animal than a quantity of food.

In fact, a sick animal will rarely eat, so that a bottle of oatmeal or linseed gruel will do more good than allowing the animal to wander about and pick up a little solid food.

It is in the care and nursing of sick animals, more than in anything else, that the secret of the success of some men above others in the treatment of the diseases of animals consists.

XVI.

SCAB IN SHEEP, ITS PREVENTION AND CURE, AND THE BENEFITS TO BE DERIVED FROM THE PASSING OF A COMPULSORY SCAB ACT.

A PRIZE ESSAY.

By "Senjeon"—W. George—*Graham's Town.*

Revised, amended and printed under authority of the Joint Committee of the Port Elizabeth Chamber of Commerce (Incorporated) and the P. E. Agricultural Society.

Were an enemy's cruiser to anchor off Port Elizabeth and levy the moderate war indemnity of a million sterling, how intense would be the disgust of the country, not only at the insult offered to the flag, but at the sum paid out for which no value was received. How the loss would be discussed in every town, village and homestead from the sea to the banks of the Vaal River. And yet we submit to a like sum being annually drained from our resources by an evil that it is in our power to remedy—by an evil that we could stamp out for ever—at a cost of one-fifth this yearly tax.

Scab in sheep has brought about a deterioration of Cape wools which would have roused the whole country to united action had its inroads been more sudden. For years we have looked on, almost passively, while this scourge has spread from flock to flock, and from district to district, and we have grown familiar with the fact of the steady decay of the great sheep-farming industry of South Africa. The consequences would have been earlier forced on our notice had not the loss been supplemented for a time—first by diamonds, and afterwards by feathers. Now that the revenue from these latter articles of luxury seems threatening to fail us, it is high time that we gave more attention to the great staple of export, which no caprice of fashion can put out of use, and on which we must mainly rely for a revival of agricultural prosperity.

We might regard our own case with less concern were

the falling off in returns for wool equally shared by all the wool-producing Colonies; but such has not been the case. Australia has made enormous strides both as to quality of wool and the quantity produced, while the Cape has advanced little in the latter respect, and has even declined as to the quality of its clips. The comparison is the more worthy of note from the fact that, the two Colonies resemble each other in climate, and in the unfortunate frequency of drought.

In the Industrial Exhibition of 1862 some of the finest samples were drawn from Cape exhibits; and on a question as to the relative merits of different Colonial wools being put to a large Bradford manufacturer, he expressed the opinion that Cape wools (taken all round) equalled anything that came to the English market. It is needless to consider how such a statement would be received at the present day. The catalogue of any London wool sale will show us in what estimation our shipments are now held as compared with those of other countries. Two parcels may stand together in the sale-room, and to the eye may appear equal; but the Cape parcel will not realize within 2d. or 3d. the price of the other, because the buyer takes it for granted that, coming as it does from the Cape, it must be more or less "scabby," and will, therefore, prove "breachy" in working. The Colonial merchant and shipper knows but too well the stereotyped words that he will find on opening the letter of his London broker, namely, *Short Staple and Scab.* That Scab is at the root of all the mischief there is not a doubt. The wretched and universally condemned practice of shearing every six months would not be adhered to but for this disease compelling it; and even with this frequent shearing it is possible, on some farms, to see half as much wool hanging about in the bushes as goes through the shearing house.

THE ACARUS, THE CAUSE OF SCAB.

It is not uncommon to hear comparisons instituted between the *scab* of different countries, and statements made as to the respective severity of each. There are, however, no such distinctions in reality. Drought, poverty, sickness, and other local influences may aggravate the disease at a given place and at a given time; but its sole cause is the presence of the *Acarus* insect, which on coming into contact with a sheep at once travels to the roots of the wool and burrows into the outer or *scarf skin*,

which is its natural breeding ground. This causes the irritation, which developes into scab. Those who still believe that the acarus is a consequence, and not the cause, of the disease may in a few days convince themselves to the contrary by the following simple experiment. Pull a lock of wool from an infected spot and shake it over any smooth black surface, when by aid of a magnifying glass of low power the insects will be visible as white moving specks on the dark ground. If the wool is shaken over a mirror in the sunlight the insects will be visible to the naked eye. Then select a healthy sheep, not over fat or with an excess of yoke in its wool, part the fleece asunder, and then blow in the acari from off the mirror, and then isolate the sheep. On examination of the spot thus treated it will be found after a few days that the skin is slightly discoloured; by the tenth or twelfth day the animal will begin to scratch, and by about the sixteenth day the sore will have burst, when the acari will leave it, the females setting out with their young attached to their legs to search for a healthy part of the skin. The young broods average 12 to 18 each. These within a few days all burrow into the skin for themselves, and within a short time of infection taking place there are tens of thousands of them tormenting the sheep, which becomes a source of infection to the whole flock, as does every fence, bush or stone against which it rubs. The experiment has been tried of inoculating with male acari only. These burrow into the skin, and in due course the usual discoloration appears; but nothing further comes of it, and the skin soon regains its healthy appearance. Not only is scab impossible where the acarus does not exist; but, further, no possible condition of health or sickness can produce the insect in a *clean* flock on *clean* pasture, unless it is conveyed from outside either by stray sheep, or by the clothes of the herd, or by materials used among infected flocks.

There is no such thing as

SPONTANEOUS GENERATION.

In the days of Aristotle this plausible theory was applied to the case of eels, frogs, bats, and reptiles and insects without number, as a convenient solution of problems difficult to investigate. Its advocates have given way step by step, till at last they have been driven out of their redoubtable stronghold in infusorial life by patient investigation, which was impossible previous to the perfection of

the microscope, and which still might remain matters of doubt but for the painstaking researches of M. Pasteur, a passage from whose writings may here be aptly quoted as expressing the opinions of the greatest authority of the day. He says:—"Il est au pouvoir de l'homme de faire disparaître de la surface du globe les maladies parasitaires si (comme c'est ma conviction) la doctrine des générations spontanées est une chimère."—i.e., "It is in the power of man to banish parasitic diseases from the face of the earth, if, as I am convinced, the doctrine of spontaneous generation is a myth."

And let it be remembered that the parasites of which M. Pasteur speaks (infusoria, of which a million are contained in one drop of water), are as much smaller than the acarus as the acarus is smaller than the sheep. But to leave the scientific for the practical, there can be no more complete refutation of this theory than the fact that Australia has stamped out scab. As long ago as 1870 Mr. J. R. Graham, an Australian authority on farming, was able to write of scab as a thing of the past in the Colonies of Queensland, South Australia and New South Wales, while he upbraided the people of Victoria for still permitting it among their flocks. The latter Colony, however, has since eradicated scab. The dips now shipped to those places being for the destruction of ticks, which are not tolerated, though they cannot be stamped out, because they can exist on grass as well as on animal life. No more important evidence was given before the Select Committee on the Scab Act during the last session of Parliament than that of Mr. John Frost, M.L.A., who stated that during the late unprecedented drought in Australia as many as 80,000 sheep had died of starvation on one run alone without a single case of scab having appeared. If experience on such a scale as this is not enough to explode the old fallacy, it is difficult to see what is. All parasitic life singles out the poorest and sickliest animals for its attacks, but does not originate in them. The skin of a lean, starving sheep can no more induce the spontaneous generation of acari than a rich piece of grass land can spontaneously generate a flock of sheep to graze on it. Once dispossess the minds of men of this bugbear—of spontaneous generation—and all the rest will follow as a matter of course. This lies at the root of all the opposition to a Scab Act, nor is it unnatural for those who believe in it to oppose measures for a *special* effort *under compulsion*, the effects of which they believe may be all neutralized the month after.

1. Filaments of Merino Wool, magnified 600 diameter.
   Vezel (draad) van Merino Wol, 600 maal vergroot.
2. Breach caused by starvation.
   Break veroorzaakt door verhongering.
3. Breach caused by Scab.
   Break veroorzaakt door Brandziekte.

EFFECT OF SCAB ON HEALTH OF SHEEP.

The farmer and the wool-broker view the question chiefly as to its bearing on the quantity and quality of wool, but the veterinarian regards it principally as to its effect on health. No sheep, we are told, is in sound health when suffering from scab. There is always more or less chronic inflammation in the digestive organs, often spreading to other internal parts. The result is a weakness of constitution that causes the animal to succumb to any unfavourable condition of pasturage or climate that it might otherwise have pulled through. The transmission of this weakness to the progeny, it is needless to say, brings about a deterioration of breed, which, however slow it may be, is, nevertheless, a certainty,

EFFECT OF SCAB ON THE STAPLE.

The thickness of a filament of ordinary Merino wool is about the 750th of an inch, while the serrations or scales number from 1,800 to 2,000 to the inch. To these serrations wool owes its property of locking together in the manufacture, or, as it is called, its *felting* property, and on their number and regularity greatly depends the value of the wool. Such portions of the filament as come through the skin when diseased by scab are not only less in thickness than the portion grown through the healthy skin, but also the serrations are either imperfect or obliterated, and when seen through a microscope the faulty part presents the appearance of a *chafed rope*. This constitutes a *breach* in the wool.

Whether fleeces become breachy through scab or through a period of starvation, the effects are much the same, for however sound the staple may be above and below it, the breach remains as a weak point, and, as we all know, the strength of a chain is only the strength of its weakest link. (See plate II.)

CURE AND PREVENTION.

The relative merits of different dips are frequent subjects of discussion. In turn tobacco water, corrosive sublimate, sulphuret of lime, Bigg's, McDougal's, and, lastly, Cooper's, have all been in vogue. As far as the killing power of these dips is concerned, it will be found, on applying them to acari placed under a microscope, that all are fatal to the insect, and those cases in which the dip is said to have

failed are probably less owing to the fault of the compound than to some accident or oversight in the process of dipping. The eradication of scab in Victoria was effected by the use of sulphuret of lime, which had just before that come into notice (1870).

In the neighbouring Colonies the same results had been previously obtained by using either tobacco water alone or that with sulphur added. The proportions were four to five ounces of tobacco to the gallon of water, and three to four ounces of sulphur, the latter being held in suspension by constant stirring. The tobacco was (like tea) placed in boiling water, but never boiled, as that greatly lessens its power. The immense advantage of *dissolving* the sulphur by means of lime was at once recognized, not only for its economizing the weight of sulphur used, but because this liquid was an *immediate poison* to the acarus, as well as by giving off sulphurous acid gas, which latter was the only means by which the *free, undissolved* sulphur acted as an insecticide. The dip known as Cooper's is sulphur mixed with some solvent powder. Whether it contains any other ingredient the writer is unable to say. In whatever form used, sulphur recommends itself for efficiency, cheapness and safety in handling, and, above all, for the time its effects continue active after dipping. The cure of scab, by whatever treatment, may be assisted by giving sulphur internally, which is easily done by mixing a little with the salt in the sheep's salt troughs. Different farmers give their preference to different dips, no doubt from the result of their own experience, and it can never come within the province of an individual to dogmatize on which dip should be used by all. The grower of tobacco might reasonably prefer to use his own produce, and those who have met with success in the use of any other compound have a good reason for adhering to that.

DIPPING.

The most approved time for dipping is about fourteen days after shearing; by this time the wounds made in the skin by the shearers have healed, and sufficient fleece has grown to retain the desired quantity of the dip necessary to kill the acari. This last condition will be understood when it is known that the most potent dips take from an hour upwards to kill the acari. Select a hot dry time for dipping, if possible, as under such conditions those acari which have been removed from the bodies of the sheep on to the veldt, bushes, &c., will die and wither up much sooner than during cool, damp weather.

Good soaking rains are, however, the best disinfectant of the veldt and kraals, as they hatch out all the eggs or destroy them.

When it is remembered that the escape of a single acarus out of millions that have been destroyed by dipping, will, in a short time, develope the disease in full force again, we see the importance of guarding against those accidents that may be caused by the momentary carelessness of a herd. If there is one place more than another that demands the careful and incessant oversight of the farmer, it is the dipping tank. The complete immersion of every sheep is indispensable, and even this will not suffice for animals that have hard patches of scab on them, some of which patches are as impervious to the fluid as is a deal board. All such should be previously separated from the flock, and the hard scab be removed, and the part *bottle dressed* before the general dipping begins.

Count should be kept of each clump of sheep while standing to drain, and a temporary brand-mark be placed on each, to enable the herds to pick out from the dipped flock any sheep that have not passed through the tank, through leaping hurdles or by other accident. The sheep should be driven from the draining ground to veldt reserved for the purpose, and if, for fear of wild animals or thieves, they cannot be allowed to lie out in the open at night, they should be hurdled there, or new kraals should be prepared on the reserved veldt. *One night passed in their old kraals would render worthless the most effectual dipping.*

SECOND DIPPING.

To insure a complete cure of scab, it has been found necessary to dip the flock a second time, after an interval of ten days. This is in order to kill all the acari that are hatched out subsequent to the first dipping, and before they in their turn have commenced to breed. The species of acarus, which is the originating cause of the common scab of sheep, is much easier reached by the dip than the species which cause the scab in goats, as it does not burrow into the skin, but pricks the skin by its sharp-pointed mandibles (see illustrations). This pricking causes an effusion of serosity from the skin, upon which the acari live. The remainder dries into a hard crust or scab, underneath which the acari lodge. In the goat the acari burrow under the epidermis, and are consequently much more difficult to destroy. A hot dip has much more effect than a cold one; especially is this requisite in dipping boer goats.

PREVENTION.

If once the scab were thoroughly eradicated from the Colony, the prevention of its re-appearance would consist mainly in guarding against its re-introduction. This would necessitate the total prevention of infected animals being brought into the Colony, or of anything that had been in contact with such, in the shape of wool, hair, skins, &c. The benefits which would be manifest from possessing clean flocks would render any sacrifice for that purpose an easy matter, as witness the prompt action of the Australians in such a case.

THE SCAB ACT.

That a plea should be needed for the only means by which scab can be stamped out is a fact that could only cause astonishment in a stranger who, for the first time, was made aware of the circumstances of the Colony. All farmers admit the *possibility of cure*, and there are, perhaps, none who would like to admit that they had never effected one, for a time, on their own flocks. They have examples before them of men who for years have kept scab out of their own flocks. These few who have done so (perhaps not one in a hundred) have reaped the benefit in the shape of advanced prices for their clips, and they would have obtained higher prices still but for the beforementioned fact, that the best clips shipped from our ports suffer through the bad repute in which our wools, as a whole, are held. Were the delinquents the only sufferers by their own carelessness, it would not matter so much as it does; but, unfortunately, immense labour and trouble are imposed on those who keep their flocks clean, through their unavoidable contact along their boundary line with the scabby flocks of their neighbours, an evil which even wire fencing only partially protects them against, hence the *imperative necessity* for a compulsory Scab Act. One of the primary laws of civilization is, that the community shall be protected from preventible injuries and nuisances caused or permitted by any of its members. This is eminently a case that calls for State interference. With a Compulsory Scab Act this pest would soon be stamped out of South Africa; but without one, or with a Permissive Act only, it *never* will be.

Twenty years ago the Australian flocks were in the same condition in which ours are now, and the believers in spontaneous generation took the same stand that they now do here, but by means of a stringent Scab Act all was changed, and at the present day the flocks of those Colonies

number 72,000,000, without a spot of scab among them! Three or four years ago an outbreak took place there, owing to the importation of some American rams. On its being discovered, the district was proclaimed infected, and the authorities took the matter into their own hands, dipping the sheep and burning down every wood fence, shed and shearing house in the infected places, the property being valued at £22,000, the Bill providing for compensation to the owners passing through the Parliament without a debate, so great is their dread of scab. The prospects of this Colony, and of the Eastern Province in particular, would indeed be gloomy were it possible that, through prejudice, or through the factious opposition of political parties, this long-delayed, but much needed, legislation were still further postponed. It is to be hoped that the time is not far distant when our farmers will look back to the present in astonishment, and will wonder how such a disgraceful, rotten state of things could ever have been tolerated.

Men who have travelled pronounce South Africa to be the finest field in the world for the sheep farmer, if scab were only eradicated. Nowhere else can he start on a paying scale with so small a capital as he can here. In other Colonies sheep are boiled down for the sake of their fat, while our farmers can sell their sheep to the butcher at ten times the value of the fat.

In conclusion, it may be remarked that the *united* efforts required for the final eradication of scab would involve little if any more labour or expense to the individual than is already undertaken voluntarily by thousands of men, at chance intervals and without concerted action, and, in consequence, without permanent success. It is mainly through enforcing this *simultaneous* action throughout the country that a Scab Act has always proved so effective. By a small amount of extra exertion for a few months the farmer would be permanently relieved from the periodical work of dipping, and would very soon find his income increasing; and it may very safely be predicted that a time of prosperity would open up, such as has not hitherto been known in the annals of South African sheep-farming.

XVII.

SHEEP-FARMING, AND THE GROWTH AND PREPARATION OF WOOL FOR EXPORT, TO WHICH THE PRIZE OF £10 WAS AWARDED.

By Arthur Francis, *Glen Cairn, Cathcart.*

Sheep-farming is *one* of the most—if not *the most* important source of wealth to this Colony, for not only does it give a large amount of produce to export, but food supply for local consumption. Anything—even an essay—which will tend in the slightest degree to improve or increase that industry, will be a step in the right direction.

In the following essay my intention is to avoid all theory, and give, as best I can, my practical experience of sheep-farming, in several localities, during the last twenty-four years.

In the first place I will endeavour to give the reasons for

THE LOW PRICE OF CAPE WOOL

on the Home market; for when a fault is found, it is more easy to discover the remedy.

While it must be remembered that there has been a fall in the price of wool of all descriptions, from all countries, the fall in Cape wool has been more in proportion, and has, at present, reached such a point that, it will hardly pay a farmer a fair interest on his capital. In fact, where high rents are paid for grazing, or where the interest on the capital involve it in the purchase of a farm and sheep, it will be found that, after the necessary expenses have been deducted, less interest will be made on the capital, than would have been made, without the risk and anxiety of farming, if the capital had been invested, by way of loan, on fixed property.

The first cause of the low price of Cape wool is

FALSE PACKING.

This I believe occurs more frequently than is generally supposed. It is done in many ways: putting bad fleeces into the middle of the bale; putting greasy fleeces in with washed; putting in sand and dirt amongst the wool, or

shearing part of the sheep when wet with dew or rain, or before they are dry after washing.

Only a few days ago I was informed by a neighbouring farmer—one who thoroughly understands the native language—that while shearing he heard the shearers discussing the different masters they had worked for. One of them informed the others that he had been shearing up-country, and the farmer, before commencing, had some loads of sand scattered over the shearing kraal for them to shear on, so that the greasy wool would take up the sand and cause the fleece to weigh heavily.

I am afraid that such dishonest tricks are sometimes resorted to, for cases have occurred where sand by the shovel-full has been mixed with the wool.

Some wool-buyers are greatly to blame in this matter, quietly compromising such cases instead of prosecuting. A merchant should feel in honour bound to make an example of any one guilty of wilfully false packing, not only for his personal benefit, but for the good of his brother merchants, the honest farmer, and the credit of Cape wool on the Home market. I feel sure every honest farmer would be glad to subscribe towards such a case. A buyer having once bought wool on the London sales, falsely packed, will give Cape wool the cold shoulder in future.

Another cause of the low prices obtained is to the

BAD GET-UP OF CAPE WOOL.

I fearlessly assert that this has been brought about more by the ignorance and neglect of the wool-buyer than by the laziness of the farmer. Years ago the majority of the farmers did their utmost to get up their wool to the best of their ability. Men stood in the water and thoroughly hand-washed every sheep, or if spring-washed, the unfortunate sheep were made to swim 20 or 25 times through the water. The sheep were then kept on the grass and shorn as soon as dry. Then some of the wool-buyers complained that there was not sufficient oil in the wool, that it was too dry, and would not work well. The farmers then began to let the sheep run a few days after washing, to get up the yolk, or, as I have heard, some actually oiled them.

Then farmers ceased to get up the wool. The reason why they did so, and it had become a habit, arose from the fact that the merchants made no difference in price, between the wool got up in a first-class manner, and that of the farmer whose wool was called "fleece-washed," but was little

better or lighter than grease. I was some years ago offered by the principal wool-buyer in a district town, fleece-washed price for my grease wool. He could not distinguish the difference between my wool and a load of so-called fleece-washed he had just bought as such, but acknowledged mine was quite as clean. Had I been dishonest and accepted his offer, he would probably never have discovered his mistake. I have known a merchant buy wool—so-called fleece-washed—simply on the word of the owner, that it was "about as usual" and never cut a bale. When the careful farmer discovered that he got no more for his well-got-up wool, than his careless neighbour for his, he saw, not only that all his trouble and energy were thrown away, but that he was actually punished for his trouble by being money out of pocket every shearing, his wool being much lighter when cleanly got up. I must confess that after some years trying to get up my wool as carefully as possible, and finding that I got no more for it per pound than did my neighbour for his, which would weigh about one-third more, I was, in self-defence, obliged to go with the crowd, half wash my sheep, let them run a month, and get the usual price.

I am thankful to say that wool-buyers are now not only better judges of wool, but make a difference in price, according to the quality and get-up of the wool. This fact will tend more to cause the farmers to improve the get-up of their wool and retrieve its character on the Home market, than most people will imagine. It may be asked, "Why did not the merchant make a difference in price according to quality?" Because the selling of wool was a sort of barter. The merchant bought it for the sake of selling his goods, and he knew that if he gave one customer more for his wool than another, the latter would be offended, leave him, and deal at another store.

Another serious fault in our wool is

WANT OF EVEN STRAIN,

which has arisen from farmers changing their minds, as to what class of sheep they wish to breed.

A manufacturer goes on to the wool sales, and examines different lots. For his special class of goods he requires a particular class of wool. We will suppose him examining a lot of ten bales. The first few fleeces he examines are exactly the class of wool he needs; but on further examination, he finds other fleeces of an entirely different strain,

which would be useless to him for his class of goods. He goes to another lot of ten bales, and finds that they are not so good for his purpose as the first few fleeces he examined in the first ten bales, but the wool in the second ten is of a far more even strain, so that he can use it all in his manufacture. He will give more for the second than for the first ten bales. This "fault" in Cape wool has arisen from, I repeat, the changeableness of breeders. A farmer will breed from a certain class of ram for a few years, then another class of ram is imported, and that becomes the fashion. He gets some of the new import, but in a few years he comes to the conclusion that his sheep are too small, he therefore buys rams of a larger breed, and thus again changes his sheep—and his wool. Then he thinks his wool is too coarse, so he gets rams of a finer wool and smaller carcass; and thus he goes on till his sheep are a lot of mongrels, with hardly two sheep in his flock having the same strain of wool.

For some time past I have been gradually coming to the conclusion that there is

AN OVER-PRODUCTION OF FINE WOOL

to meet the requirements of consumption.

Many classes of goods are produced from wool, from blankets to broadcloth, and if there is an over-production of any one class of wool, it is natural to suppose that the lower, or most inferior class of such wool, will gradually become more and more neglected, till it will be almost unsaleable. The question we have to ask ourselves is, has this fact anything to do with the present low price of Cape wool? Is there an over-production of the finer classes of wool, such as merino? Are not most countries aiming at producing fine wool, while very few countries are producing wool of a coarser strain? Are Cape wools, owing to mixed breeds, scab, bad get-up, false packing, &c., the class which will first become unsaleable? From the sources of information open to me, I believe the coarser classes of wool have not deteriorated so much in value in proportion as the finer sorts.

One of the

PRINCIPAL CAUSES OF THE LOW PRICE

arises from the prevalence of scab in our flocks, and this cause will never disappear till we have a general Compulsory Scab Act in force; for, so long as such an Act is

not in force, no farmer, however careful he may be, can be safe from the infectious sheep of his more negligent neighbours infecting his also. It must be borne in mind that, Scab not only ruins the part of the fleece infected, but weakens the whole system and impoverishes the sheep so that no part of the fleece of a sheep badly infected with scab, will be well grown, strong and healthy.

I have made the foregoing somewhat extended remarks on the causes of the low price of our wool, because the remedies are so simple, that, the causes being pointed out, our merchants and farmers have, to a great extent, the remedy in their own hands.

I would now say a word or two on the

BREED OF SHEEP.

In doing so I shall not discuss and describe the different breeds individually, as such information can be obtained from any book on sheep, but go on to what I may call general principles.

From my own experience, I should strongly recommend some strain of the merino breed, as that seems well adapted to the country. It is a hardy, good feeder, and perhaps the most profitable, taking all things into consideration. I really do not consider that it is of such great importance what particular class of sheep a farmer breeds from, so long as it is hardy and adapted to the country; but what I do consider of the utmost importance is, that he breeds from the best of the class he aims at. Let a farmer, taking all things into his deliberate consideration, decide as to exactly the class of sheep he intends to breed from, and let all his efforts be directed to bring his flock up to the standard he has pictured to himself. Let him get the best class of rams obtainable, always from the same breeder, and on no account ever allow, not only a cross, but even a ram of the same breed, from another breeder to enter his flock. Let his effort be to get his flock of one strain. After he has got his flock up to a certain state of evenness and perfection, he would probably do best by

BREEDING BY SELECTION,

from his own flock.

I know all that has been said against in-and-in breeding, yet, taking all things into consideration, I am a firm believer in breeding by selection, when one has brought his flock to a certain state of perfection, by imported blood. It is said

we require more imported blood, but I think we have had too much imported blood of certain, or uncertain, sorts already. We have, at least, had too many sorts of different strains and breeds, till many flocks are really a mixture of several breeds. Some farmers have the idea that an imported ram *must* be good, yet some imported rams are inferior to many bred in the colony. If a farmer imports, let him import the very best.

Another advantage would probably arise from breeding by selection. As a rule, an animal and its descendants become acclimatized, and adapted to a country, its pasturage, &c., and it is probable that by breeding by selection, the sheep will become better suited not only to the colony, but even to the locality in which they are bred. Some persons hold the belief that, if no new blood is imported, sheep-wool will greatly deteriorate. To the notice of such, I bring the fact that, perhaps, the finest wool in the world is grown in Australia, and that the flocks from which that wool comes, have been bred by selection. I again urge that when a farmer has once decided what class of sheep he desires, he should never change the breed.

TUPPING SEASON.

The rams should be placed with the ewes 145 to 150 days before it is desired to have the lambing commence. If the rams are in good condition one will be enough for fifty or sixty ewes. If the rams can be artificially fed for a month before they are placed with the ewes, it will be an advantage.

Perhaps the most anxious time for the farmer is

THE LAMBING SEASON.

Owing to the great differences of pasture and climate, arising from elevation, and other causes, it is impossible to recommend any particular month as the best for lambing. Each farmer must, to a certain extent, find the best time, by experience; but one rule will hold good in all localities, viz., that the ewes should have good and abundant food for at least fourteen days or three weeks before lambing, for if the lambs arrive at the same time as the grass in the spring, the ewes have little milk, the lambs suffer, and some ewes will "throw away,"—refuse to take their lamb.

A word or two about this "throwing away." This very often arises from the poverty of the ewes, and frequently from the ewes being crowded into a kraal where they lamb,

and the lambs get mixed up, or some ewe which has not lambed fancies she ought to have a lamb, and entices the lambs from their mothers. If ewes are in good condition, and two hundred of them are placed in a good-sized camp, they will lamb down with very little loss and trouble, the ewes very seldom refusing to take their lambs. In the morning and evening the ewes which have lambed should be quietly separated from the others and put out of the camp. As the 200 ewes lamb out, others can be put in. At some, if not in all, localities sheds are necessary to prevent loss of lambs in cold rain, for most lambs born in cold rain will perish. If there is a large shed near the camp, and when rain comes on the ewes to lamb are placed in it, the lambs will be saved, as a lamb will resist a deal of cold and rain if once dry and has sucked. Very young ewes ought to be removed from the ewe flock before the rams are placed in, as if they are allowed to lamb neither the ewe nor lamb thrives. Many are the devices to get a ewe to "take" her lamb which she has refused. Tying up is the general plan, but a few little enclosures like very small pigsties are best; covered, if possible, the ewe and lamb being placed in one soon accomplishes the end desired. Here, where animals are ravenous after salt, we sometimes wet the lamb's tail with strong salt and water; the ewe licks it and takes her lamb. Sometimes a motherless lamb is easily provided with a mother when a ewe has a dead-born lamb, by taking the dead lamb away at once—rubbing it on the live lamb and giving the latter to the ewe. If a ewe has refused her lamb one year and not been made to take it, she will refuse her lamb the next season also. These are small matters, but often save a lamb with little trouble. If lambs and ewes must be kraaled, let the kraal be very large, but of course it is far better if they can run. Lambs should be kept in little lots of forties or fifties for a few days before being mixed with large lots.

CROPPING LAMBS.

The best time to crop lambs is when they are from two weeks to a month old. It is best to perform this operation in the morning, for if done at night the lambs lie down at once, and the point of the bag is inclined to close and retain some blood in it, which may bring on inflammation. If cut in the morning, the lamb has to move about, and there is not so much danger from this cause, but if any are

observed to walk stiffly the next day they should be caught, and the bag opened to allow any matter or blood to escape. Sometimes a lamb bleeds to death: this is caused by cutting off too much of the bag or pulling the testicles out with a jerk. Lambs should be cropped when there is a medium temperature, as there is danger in excessive heat or cold.

REMEDY FOR WORMS IN LAMBS.

Worms are one of the great drawbacks to lambs. Sometimes, when the lambs are about six weeks or two months old, they get poor, and show indications of becoming pot-bellied. This is almost invaribly caused by worms of one or more descriptions. If some remedy is not tried, the lambs will not thrive nor grow up into healthy sheep.

Some farmers dose them with turpentine and milk. I have always used sulphate of iron and salt, which I administer as follows:—The sulphate is ground fine, and mixed up with twice as much fine salt, and allowed to remain four or five days, being occasionally stirred up. One morning I go to the kraal gate, a man kneels beside me, while others catch the lambs and bring them to him. He holds the lamb's head up, opens its mouth, and I put as much of the mixture into it as lies on the *handle* of a tea spoon. I then pour a spoonful or two of warm water into the lamb's mouth, and he is turned out of the kraal, lest he should have a double dose, which might prove fatal.

Some farmers have told me they have killed lambs by giving them sulphate of iron, which is very probable, if the dose was too large, or the lamb very weak. I have been very successful with the sulphate. The next morning after dosing, I have found the kraal mottled with little heaps of worms.

FEEDING LAMBS.

Except with artificial feeding, every lambing season is, to a great extent, a lottery, owing to drought, &c.; but where artificial feeding can be carried out properly, it can be made almost a certain success. Barley, turnips and mangold are the best food. But if a farmer attempt artificial feeding, he must make sure of having sufficient food to carry the lambs through till there is sufficient natural food to carry lambs on.

Too much cannot be said against

KRAALING SHEEP,

for it injures them and their wool in many ways. I know

that many farmers are so situated that they cannot help themselves in this matter, and many who could otherwise do so are obliged to kraal their sheep, to prevent, as far as possible, the ruinous losses from stock thefts. Sheep, to thrive and be healthy, should be confined and interfered with as little as possible; the more they can be allowed to follow their own inclinations, as they would in a state independent of man, the more they will prosper.

A very great deal has been said about

SHEARING TWICE A YEAR.

I am afraid that shearing once a year will not be generally carried out till we have a compulsory Scab Act, for until such an Act is enforced, no farmer can be safe from having his sheep infected with scab. My experience is certainly in favour of once shearing, as several advantages are derived therefrom. In the first place, you save the trouble and expense of one washing and shearing; you save half, at least, of the risk of heavy losses by cold rain immediately after shearing; you have a class of wool you can properly sort, and for which you will get a higher price; and I believe the sheep will be more healthy.

In shearing once a year, I believe the proper shearing time would be about the beginning of December, when there would not be so great a risk of cold rains, and the sheep would be well-clothed in wool, before the severity of the next winter. There are only two disadvantages, and these I will mention. If, after having six or eight months' wool on, perhaps in the winter, your sheep become infected with scab, you are placed in a very annoying position. You may, by hand-dressing, check the spread of the disease, but you will never by hand-dressing eradicate it. At every spot you hand-dress, you stain or destroy the wool. If you dip, you must go to great expense, will lower the value of the wool, and may make a tender place in the staple with the dip.

The fear of getting scab into the sheep, when the wool is long, is one which prevents many farmers from shearing only once a year. This one great objection would be removed if a Scab Act were passed. The other objection has less weight. In more than one instance I have examined a twelve months' clip, and found it tender—generally about half way down, where the wool, if pulled, would break off as evenly as if cut with a knife. In some instances, I believe this tender place was caused from the

sheep having been dipped just when that tender part was growing at the skin. In other instances, where the sheep had not been dipped, I accounted for the tender place, from the sheep having been in very low condition just at that stage of the wool's growth. I have been informed, however, by a gentleman, on whose word I can depend, that he met with a case where the sheep had neither been dipped nor had suffered from poverty, yet the wool had a tender place in the middle of the year's growth, where it broke off as if rotten. We say "use is second nature:" Is it possible that a sheep for years being shorn every six months can have formed a tendency to cast its wool at that time? I cannot believe that such is the case, but otherwise it is hard to account for the fact mentioned above. A year's clip with a tender place in it, is not of so much value as a six months' clip of healthy wool. My own experience —of once shearing—is that, taking all expenses into consideration in twice shearing, I made just as much money by the one clip as I did by the two, but I gained the advantages of only one trouble in shearing, and one risk of heavy losses, after shearing, by cold rain. I believe that five years hence, a Scab Act will be in force, scab almost eradicated, and the great majority of farmers shearing once a year.

Continual complaints as to the

GET UP OF CAPE WOOL

are heard, and these complaints are not without reason.

I have endeavoured to show that, the merchant was quite as much to blame as the farmer in this matter; but we have different times now, when a farmer can get a price in accordance with the quality and get-up of his wool; if not from the merchant, at least by shipping it. In the first place, wool from sheep which have not been kraaled, will invariably be superior to that from kraaled sheep.

To get up wool properly, it is necessary to have a good shearing shed and sorting table, one part of which should be barred or wired like a sieve, so that when a fleece is shaken over it, any dust or small particles of dirt may fall through.

The fleeces should be skirted, and the locks and pieces packed separately, and each fleece tied up separately. A fleece is skirted lightly or heavily, by putting all the belly-wool and the wool from high up the legs, amongst the locks and pieces, or taking out only the most inferior of the wool

on the belly and legs, in front of head, &c. In fact all inferior wool, coarse or stained—especially the latter in washed wool—should be put amongst the locks and pieces. It will be found, however, that it is almost impossible to sort properly a six months' clip, as the fleece gets so mixed up in shearing.

In "getting up" fleece-washed, great care must be exercised after the sheep are washed, as driving them a short distance on a dusty road or into the shearing kraal, when the approaches are dusty, will greatly spoil the colour of the wool. The native shearers coming into the shed from the shearing kraal, after catching a sheep, will, if not checked, bring in on their feet, dust, dirt or dung, which will be tramped amongst the wool, and greatly tend to spoil its appearance. In washing sheep it is a very great advantage to have them wetted the night before, by putting them once through the water. As the washerwoman "soaps in" her clothes the day before, so should the farmer "soap in" his sheep—by wetting them the night before he intends to wash them; for it must be remembered that, the yolk in the wool is an imperfect kind of soap, composed principally of potash and oily matter; and if the sheep are thus "soaped in," they will wash with half the trouble and be twice as clean. If there is a heavy thunder rain the night before one washes, it is a double advantage, for it not only wets the sheep but lays the dust.

After washing, the sheep should be kept on the grass, and shorn in three or four days, when there will be sufficient yolk in the wool to make it workable, in colour bright and clean. Hand and pump-washing have gone out of fashion, but the sheep can be thoroughly washed by springing, if the water is clean, deep, and with sufficient run to take off the dirty water, each time the flock swims through. An interval of at least half-an-hour should be allowed between each spring; and the height from which the sheep spring should be three feet above the surface of the water, so that their heads go properly under.

IMPROPER BRANDS.

Complaints are made of tar in the wool. This is from the brand or letter on the sheep. As far as I know, tar is never used, but lamp black and oil. If in shearing, the tips of the wool with the paint on them could be removed, it would be beneficial. I cannot recommend any paint to be used which would not more or less damage the wool,

but I consider that some of the farmers use letters of an unnecessary large size, some of them being nearly a foot long, when one of four inches would be quite sufficient to distinguish the sheep.

There are a few more points I must mention. A word or two must be said about the

RUINOUS LOSSES, CAUSED BY SCAB,

to the sheep-farmer. Not only is the wool greatly injured by the scab, and the different dips used to cure it, but the constitution of the sheep is injured, and thousands of sheep perish in cold rains, which might have survived had they been free from such. Scab is caused by insects or *acari*, which burrow under the skin, live on the sheep, and reproduce about every fourteen days. Some farmers believe that scab comes from dirt or poverty. This is a most amazing opinion to be heard in the nineteenth century, and I would desire any farmer of this opinion to try the following simple experiment. Take some wool from a scabby part of a sheep, shake it over a looking-glass or a piece of black cloth in the sun, then examine it with a magnifying glass or even the naked eye, and the cause of all the scab, loss, injury, expense and annoyance will be seen in the shape of a minute insect. Let him get a few of these together, take a sheep free of scab, open its wool and place these insects on the skin, and he will, in a few days, there find a spot of scab, the sheep scratching, and very shortly the sheep as scabby as he could desire. I admit that dirt and poverty are favourable to the increase of these insects, but they can never be originated by them.

HOW SCAB EXTENDS.

The scab insect will, I believe, exist for months in a deserted kraal during dry weather, but from my experience I have come to the conclusion that moisture, in the shape of heavy rain, will put a period to their existence. Many times I have heard farmers say, they could not understand how their sheep got the scab; but there are so many ways in which they become infected that it is surprising how some escape as they do. The shepherd of a neighbour coming from scabby sheep has the insect on his blanket; sheep coming against a wire fence, the sheep on the other side being scabby; and lately, the spread of scab was accounted for by birds getting on to the backs of a scabby flock, and then on to those of a clean lot of sheep. If sheep are very bad

with scab, having hard or raw places, those places should be smeared with some fatty substance before dipping—fat, heated, with a little paraffine oil in it, being the best I know.

Sheep-farming in this colony will never be what it ought to be till scab is eradicated; and that will never happen until a stringent law is passed.

REMEDIES.

Any substance which will kill the insect will cure the scab. Many of the artificial dips are good, and will cure scab, but they have all two faults more or less; they are unnecessarily expensive, and some of them are not of even strength. Did space allow I would give the ingredients of several of the patent dips, and show that they are unnecessarily complicated and expensive, composed often of five or six ingredients, when two or three, *or even one*, would kill scab, for if any one substance will kill the insect, that one substance will cure the scab.

I am tempted to give the ingredients of just one patent dip, patented 10th April, 1879—"50 lbs. fatty matter, 25 lbs. resin, 50 lbs. soda ash, 25 lbs. borax, 75 lbs. carbolic acid, 50 lbs. of liquor calcis sulphidium (simply a liquid mixture of lime and sulphur), and 80 lbs. of extract of tobacco."

Now I have given this only that I can ask: is it really necessary to have such a combination of substances to kill a little insect?

The best dip we can have is tobacco grown by ourselves. It is or ought to be cheap, is a sure cure, does not injure the wool, nor even discolour it permanently.

Lime and sulphur is a good dip immediately after shearing, but should never be used after the sheep have been shorn a month. If used, it should be boiled at least ten minutes, and strained into the tank.

DIPPING.

A word or two about dipping. Sheep, if scabby, ought to be dipped immediately after shearing, care being taken that every part of them—head included—is thoroughly soaked. When dipped, the sheep should not be allowed to go into the same kraal as before, or sleep on the same place; in fact they ought not to graze on the same ground. If it is desired to completely eradicate the scab—which every

farmer ought to aim at—the sheep must be dipped again about the thirteenth day, and equal care be taken of them.

There can be no doubt that

SHELTER SHEDS

would be advantageous, more especially on high lying farms at lambing and shearing times, for it is only then that the sheep really require shelter. Very heavy losses occur sometimes, after shearing, which would be avoided if there were sheds. A sheep can stand a great deal of cold or hunger, but it cannot stand them both at once. Where there are sheds, sheep may be allowed to stand without food for 24 or 36 hours, or even more, during heavy rains or snow storms, without succumbing: but in an open kraal, suffering from cold and hunger, they will give in far sooner. Heavy, cold rain generally causes much heavier losses than a snow storm, as in the former, the rain soaks through the wool, and runs off the sheep, carrying the heat from the sheep's body with it. In snow storms the sheep suffer less from cold, but sometimes severely from hunger; snow storms, however, are only prevalent on the mountains. If in a long-continued rain the sheep can be let out, even for an hour or two, to feed, it may save many of them. In the colder localities the benefit of a shed will, probably in a couple of years, pay for the expense of building it. But sheep should never be put under shelter, except in really bad weather, or when newly shorn.

A very great deal might be said about the evils of

OVER-STOCKING.

Not only do the sheep often get into a state of semi-starvation through over-stocking, but I have a firm conviction that this was the first cause of the deterioration of some of the best sheep runs in the colony—in the districts of Fort Beaufort and Victoria East. Each farmer must decide how many sheep his farm will carry—one year with another—and never on any account endeavour to keep any above that number, but regularly sell out any surplus from the run. Instead of trying to keep 2,000 sheep on a farm which will only carry 1,500, instead of having those sheep half their time in a state of semi-starvation, instead of shearing from each some four or five pounds of badly grown wool per annum, let each farmer keep 1,000 well-bred sheep, which will give him eight or ten pounds of good first-class wool each year; and then he will find he can make

much more, have less trouble and fewer losses, for his money and his labour.

One of the greatest drawbacks to sheep-farming in the colony is the prevalence of

STOCK-THEFTS.

These not only cause ruinous direct losses, but indirectly injure the farmers. Many a farmer, while knowing he is injuring his sheep by doing so, is obliged to kraal his flock to prevent them being stolen, by tens and twenties. The extent of this evil is not realized by the general public, while all the punishments hitherto inflicted have utterly failed even to check the evil. It is said the treadmill is too expensive, and when a farmer suggests transportation, he is laughed at, because no country will take our convicts. Why not sendour stock thieves to the "Guano," or other islands? Farmers seem helpless in this matter, and receive very little help. Each farmer should make his losses known, and never compromise a case of theft. Counting the sheep frequently tends, to some extent, to check the evil of stock-stealing.

I will say a word or two about

THE DISEASES OF SHEEP,

but only of the one or two on which, from experience, I can offer a little advice. I have tried all sorts of experiments on all sorts of diseases. Sometimes I have thought I have discovered a sure cure, and afterwards found it utterly useless. In fact it has often seemed that the more I doctored the quicker the sheep died. This I have learned—that if sheep with fever were kept in a cool hut during the day, and only allowed to feed for a couple of hours in the cool of the evening, they almost invariably recovered. When sheep have been dying from "geelziekte"—called "hoove" at Home—generally when the pasturage was very luxuriant, they "blew up" from generated gases, and soon died. When this was the case, and I went amongst the sheep at night an hour or two after they had laid down, and made them run about for five minutes, I seldom, if ever, had a dead sheep in the morning The exercise caused them to throw off the gas.

If I now find a sheep sick and blown up, I put it on its right side, and open the stomach on the left side, just where it is most prominent. The air escapes, and the sheep generally recovers. The stomach should be opened

with a small instrument called a trocher. It can be done even with a pen-knife, or better—with the blade of an ordinary sized pair of scissors.

Then there is the "fluke" or "rot," which only appears in certain wet localities, where there is little or no saline matter. Abundance of salt, occasionally mixed with a small proportion of sulphate of iron, is a preventative, if not a cure. On the higher farms, or where there is no "brak" or saltish fountains, salt should be given, as it tends greatly to the health of the flock.

I believe it would prove a decided advantage to the sheep farming industry of this colony, if all

FARMERS SHIPPED THEIR WOOL

on their own account.

This would break down the barter system; the farmer would get the value of his wool; he would do his utmost to grow and get it up to the best advantage; the Cape wool would be improved; and eventually, instead of being a drug in the Home market it would compete with wool from other countries.

The Cathcart Farmers' Association is shipping the wool of its members, branding it with the Association brand, but refusing to brand any which is not of good quality and properly got up. This is a step in the right direction, to endeavour to retrieve the character of Cape wool.

It is impossible in a short sketch of sheep-farming, such as the foregoing, to enter fully into particulars; in fact, in doing so, if great care be not taken, statements which are true with regard to one locality may prove misleading in others, owing to the difference of pasturage, &c. Every farmer must, to a certain extent, be guided by the surroundings of his own position.

The great question at present is

HOW CAN WE IMPROVE OUR WOOL?

I would answer and, to recapitulate, say:—Let each farmer breed from the best blood obtainable by him, aiming at one strain of wool. Let him keep his sheep as free from scab as possible, and never kraal them. Let him shear once a year, getting up his wool to the best advantage and sorting it properly. Let him see that his farm is not overstocked, that his sheep may be strong and healthy. Let him, if his means will allow, enclose his farm and divide it

into camps, and have on it sheds and dipping tanks. Let him ship his wool with his name on his bales, and he will get the value of his wool; self-interest will induce him to do his best, and a healthy competition will grow up amongst farmers as to who can get the highest price on the Home market. Last, but not least, let no farmer drive off till to-morrow what can be done to-day.

Let the merchant, if he is no judge of wool, get some one who is, and in buying give a price, not in accordance with the owner's position, as to whether he is a good or a bad customer, or is deeply in his merchant's debt, but according to the quality of the wool he has to sell; and let him, whenever he discovers a case of wilful false packing, prosecute the seller.

And let merchants, farmers, and all combine to get passed in the next session of Parliament a general compulsory Scab Act, which will be for the benefit, not only of the farmer, but of the whole colony.

XVIII.

ANGORA GOAT FARMING AND THE GROWTH AND PREPARATION OF ANGORA HAIR FOR EXPORT, TO WHICH WAS AWARDED THE PRIZE OF £10.

By Charles Lee, Sen., *Korsten, Port Elizabeth.*

Beyond a doubt this country is, in every respect, suited for the production of Mohair equal in quality to any grown in Asia Minor, or any other part of the world. The large quantity exported, as well as the quality of the clips grown by some of the most enterprising farmers, amply testify to this.

Though Cape Mohair at present obtains a lower price on the London Market than that from Turkey, it is no proof that this country will not produce an article in every respect as good. As the climate and pasturage of some of our districts are so well suited to the health and constitution of Angora goats, we may entertain the hope that, in time, with judicious management, they will develope and become even larger and stronger than in their native country. If, then, we can occasionally import fresh blood from other parts, we need fear no rival whatever.

It is now more than twenty-five years since this industry was introduced, and we are compelled to admit that the average quality of Mohair produced might have been of a better quality than it is. But the fault is not in the country, it must be attributed to other causes, amongst which are, the want of a more intelligent and enterprising spirit on the part of some of the farmers, and to a careless and slovenly style of preparing the clips for the market.

Though twenty-five years may, to an inexperienced person, appear sufficient time to have developed the quality of our Mohair equal to that of Turkey, we have to remind the reader that many circumstances have to be considered, and a large allowance must be made for difficulties which no farmer could have contemplated, different indeed to any which could occur in breeding sheep, horses, or horned cattle. We need not enumerate all of them, but will name two or three of the more serious ones, such as will be useful for the future guidance of the breeder.

The first and most formidable is, that, of the Angora goat, as far as we can learn, no knowledge exists of the pure-bred animal, nor can we find any breeder who can produce satisfactory evidence that his flock is of pure blood. Consequently, the breeders of this country, in procuring rams from such uncertain sources, have to take immense risks, so much so that we have known some of the best and most careful breeders give hundreds of pounds for a ram, which afterwards proved to be a mongrel, while others again, having bought one from the same shipment for thirty or forty pounds, have accidentally obtained a pure-bred animal. In some instances these mistakes have not been detected until serious damage has been done to the flock, into which they have been introduced, by getting inferior progeny from well-bred ewes, which has thrown the breeder back a number of years. This in itself is sufficient to show how necessary it is to have our pure-bred goats registered, that is, those that have shown themselves to be pure by getting pure progeny for three successive years. Another difficulty the Cape farmer has to contend with is, that most of our stock comes from Cape ewes (a class of goat that sheds its hair periodically), so that their progeny, until far advanced in the Angora breed, will not retain their fleece twelve months. This necessitates shearing the bastard goat twice a year, thus annually throwing a large quantity of short hair into the market.

This difficulty, by careful and judicious management, will in time, no doubt, be overcome.

The last which we shall name is, that Angora farming is, to a certain extent, in the hands of a class of farmers who seem unable to recognize their own interests, and, year after year, continue to breed from inferior stock, rather than pay such prices as they can afford for a better class of ram. We have named the foregoing as difficulties in the way of our progress, in the hope that these, at least, may be speedily removed.

THE RAM.

In farming with the Angora, it is important to secure a well-bred ram.

When choosing one, while I would not by any means underrate the importance of a fleece that is in every respect up to the standard, it is most essential that there should be no fault in the symmetrical points of the animal. It is better to give way a little in the quality of the hair

than in the symmetry of the body. We prefer one with a round and fully developed body; round and full in the girth, with a fully formed belly; the legs should not be long, but proportionate and equally set, a good width between the right and left, and broad between the knuckles of the shoulders. There should be no tendency to being cow-hocked, or flat-ribbed, but throughout the animals should present a square and firm stand, forming a straight line from the top of the hips to the shoulder. The neck, as well as the girth, should be round and full; the head well formed, being broad between the eyes, with a full prominent eye; the eye-bone also should be full and prominent, dropping suddenly off to the nose bone, which should be narrow and finely finished, showing an intelligent and docile face, covered with fine silky hair. The horns, though flat at the head, should otherwise show a roundness, spreading directly away from the body, and inclining backward; the long, thin and light horn is certainly to be preferred, while the erect, thick and dark horn is most objectionable, and certainly is a sign of bad blood. The ears should be broad, thin and flat, with the outside surface covered with a short silky hair, having a bright gloss.

The fleece should be about nine inches long around the neck, and regularly formed, when full grown, showing an even and regular skirt, the whole exhibiting a general equality, excepting the breech, which in the rams may be coarser, but free from any white hair, or kemp. The whole fleece should be closely set on the body, being connected on the skin by a soft, strong, silky hair, forming into ringlets from the centre to the end. The fleece, when full grown by the side of the animal, should feel dense, soft and downy to the touch, the whole showing a bright and clear lustre. The belly and between the thighs should be well covered with soft fine hair from four to six inches long. The weight of the fleece when full grown should be about eight pounds. Much heavier fleeces are produced in the Colony, but we consider it injurious to the animal, and indeed question whether a fleece of the quality described can be heavier than eight pounds.

THE EWE.

All the symmetrical points and quality of fleece laid down as being necessary to a thorough-bred ram apply equally to the ewe, excepting, of course, the horns, with the usual proportionate allowance for the female size and

weight of carcase, &c., with a fleece of four pounds. It must be understood that the above description of ram and ewe applies only to thorough-bred animals, of the class we consider in every respect the best, and what every Angora farmer should strive to secure.

BREEDING.

The rams should never travel about with the general flocks, but be well cared for at the main homestead, by being depastured on preserved veldt, in an enclosure during the day, and comfortably housed at night. During the springing season, beside their usual food, they should have three pints of dry oats per day, and, if procurable, a good feed of green barley or lucerne; raw pumpkin is an excellent food for rams on such occasions. Every necessary purpose will be answered if the rams are put to the ewes at night only. By caring for them in this way, one will be quite sufficient to serve from seventy-five to one hundred ewes. As many as two hundred and twenty healthy lambs have been got from one sheep ram, and dropped in six weeks. The rams should not be shorn just before putting them to the ewes, and should have not less than six weeks growth of hair. This is very important, as shorn rams get comparatively few kids. If during the springing season the rams have long fleeces, it will be necessary to shear off the belly hair. We strongly recommend all goat farmers (who are in a position to do so) to keep a select flock of tested pure-bred goats from which to get a supply of rams, either for their own use, or for sale. Breeders of pure stock should be careful that a pure-bred ram is not allowed to go with an inferior-bred ewe, as his stock for some time afterwards is likely to be tainted with impure blood, the same with a pure-bred ewe that has been served by an inferior ram. To be successful in stud farming, each pure-bred ram or ewe must be named, differently marked, or tattooed in the ear, and separately registered in the same way, so that each may form the parent of a separate and distinctly registered family, every member of which should be carefully watched, so that in case of any blemish appearing, such goat may at once be removed from the select flock. From these families the stud rams should be chosen. When the scab disease makes its appearance among the flock, a bath of a mixed solution of lime and sulphur, used at blood heat, will be sufficient to check it, but must be used directly after shearing.

THE KIDDING.

Until we have our farms enclosed, great care should be taken to reserve a suitable portion of the farm for the ewes about to kid, as well as shortly after kidding, so that they may have a plentiful supply of food without travelling to get it.

The kidding should commence early in the month of August, by which time a comfortable shed should be in readiness to receive the young kids as they come on. Ewes should not be allowed to kid until they are two years old, nor after they are five. It will facilitate matters if an enclosure is made adjoining the kraal, having in it sufficient pasturage for the season, into which the ewes are to be put the day before they are expected to kid, and where they can remain for two or three days after kidding, unless severe weather should set in. This precaution will prevent the ewes forsaking their kids. After the third day, they may be put into the kraal connected with the shed, when a separate but corresponding mark should be put upon each ewe and kid. The ewes should be turned out to graze by day, and put to the kids at night. This corresponding mark upon each ewe and kid will save a great deal of trouble, as the young goats in particular are liable to refuse to suckle their kids at any time, until the kids are old enough to recognize their mothers. We cannot too strongly condemn the heathenish practice of allowing goats to kid a long distance from the kraal, and, with their front legs tied together, the kids are slung across a stick and carried, sometimes for miles, across the shoulders of the herd, and thrown down at the kraal gate, more dead than alive, often resulting in the ewe refusing to take to the half-dead kid, which again means the tying up of the ewe by the neck, and perpetrating other cruelties, which often result in the death of the kid, and sometimes of the ewe. The ewes with kids should have a plentiful supply of clean water at mid-day. When the kids are six days old, they should be turned out of the kraal during the day, when they can enjoy a free run in the open air, and, if possible, should be supplied with tender green grass or herbs and clean water. This will often prevent an attack of sore mouth and lips, which some farmers consider an infectious disease; if they should be attacked with it, the timely use of salt and water, by rubbing the lips and mouth, will soon cure it. If the inside of the mouth and throat is affected, a strong solution of vitriol used in the same way will be sufficient to cure it.

The young kids should be carefully watched, as the ticks, some of a venomous kind, attack them in different parts of the body, but generally in the opening of the hoof; the timely application of parafine or antifriction grease will be sufficient to destroy them and prevent an attack for some time. The kids should be ear-marked, and the males castrated, at about eight days old; if left longer the operation will cause unnecessary suffering. They should be weaned when six months old, but this must depend upon the state of the veldt; if very dry, it will be better to leave them with the ewes as long as they can bear it without receiving any injury. The kids should be herded separately; this will give the ewes the opportunity of grazing undisturbed.

The kids also are better for being kept separate during the day; this may be contrary to the usual practice, but we have found it advantageous to both ewes and kids.

MANAGEMENT OF THE GENERAL FLOCKS.

Where circumstances will admit of it, the kapatas, ewes, and rams, should be herded in separate flocks; and while we have to avail ourselves of the miserable kraal system, the flocks are to be turned out for grazing, in the summer as soon as it is light, and in the winter at sunrise, the herd standing at the kraal gate ready to receive his flock, to prevent them scattering immediately after leaving the kraal. The herds ought not to use the whip amongst the flock. It tends to frighten and irritate them, and when quietly grazing, if so disturbed they will not readily recover from its effects. A good herd will control his flock by whistling or with the sound of his voice, which they soon learn to recognize, and are ever ready to obey. The condition of the flock largely depends upon the disposition of the herd. It is very necessary that all the flocks should have water at mid-day, and very objectionable to have them (particularly those at the out-stations) kraaled near the water, unless they are provided with it at the other end of the grazing ground, so that they may drink at mid-day. If the kraal is placed near the water, and the flocks are not provided with it at mid-day, as soon as they are turned towards home, they naturally hurry towards the water, and by four o'clock in the afternoon, if not checked, there will be a general stampede, the strongest and healthiest taking the lead, while the poor and feeble following on, in too many instances whipped up by a cruel herd. The loss sustained in this way extends beyond the actual loss in the number and con-

dition of the stock. Footpaths are tramped in the veldt, which from the thunderstorms are washed into deep sluits, not only carrying away some of the best soil, but acting as drains, thereby preventing the veldt receiving that moisture from the showers so much needed. It will pay a farmer well to remove his kraals from the water to the other end of the pasture land, where, with a one-horse water cask on wheels, he can supply the herd with water, thus giving the flocks the advantage of drinking at mid-day. This will effect a great saving in the health and condition of his flocks.

PREPARATION FOR SHEARING.

Before the shearing is commenced, shelter should be provided for the shorn goats. Sheds, of course, are the correct thing, but where circumstances will not admit, clean, warm bush kraals in a sheltered spot will answer every necessary purpose, provided a cold rain does not set in. The shear kraals should be made by connecting twelve hurdles forming a square at the end of the shear house, opposite the doorway; the floor of deal battens, four inches by one and a half, rounded on the top, and nailed to quartering, leaving a space of three quarters of an inch between each batten and its nearest neighbour, to permit the droppings to pass through, and allow the goats to stand upon the clean dry floor. The whole should be tarred with hot coal-tar. The floor of the shear house should be made of deal and yellow-wood planks, or flat stones covered with sacking, but wood is by far the best. Four wool bags, marked 1, 2, 3, 4, should be hung in readiness to receive the different quality of hair, in a convenient place in the shear house, on the right hand side of the sorter and packer. These bags should be hung inside of boxes the size of the bags, hinged together, so that when filled the box may be opened, and allow the full bag to drop out.

THE SHEARING.

This should commence in the month of June or July Up to the present time it is found that most of the kids' fleeces are at their best early in the month of June, others come on in the early part of the season, and should be shorn at that time; if left longer the fleece will become matted and heavy, and too much for the kids to bear. Besides, they are naturally infested with lice on the skin, and if relieved of the fleece at this time, they at once begin to thrive, and, the hair growing quickly, are soon covered

and protected from cold and wet. None of the well-bred goats should be shorn with less than twelve months growth of hair, even the kids when well-bred will carry their fleece twelve months. But it must be borne in mind that the shearing time must be regulated according to the stage of breed. For, as before remarked, until the breed reach a certain stage they will cast the fleece, so that what we term the bastard goat must be shorn a second time about the month of October or November, otherwise the fleece is lost. But this does not apply to ewes suckling kids, which should not be deprived of any hair they may have at that time. It is more profitable to allow them to shed it in a natural way. Though the shearing should commence in June or early in July, to fix a time for shearing the whole flock is not wise. The better plan is to pick out for shearing all that have full grown fleeces, of whatever class, and so continue, though it may necessitate making three jobs of it, exercising care not to shear ewes just before kidding. The ewes, kapatas, rams, and kids, should be shorn separately, and their hair packed separately. It must be borne in mind that the kapata's hair becomes coarse and harsh at four years old, and should be packed with the coarser class. Goats do not suffer from being shorn in the winter, as is generally supposed. This has been tested, by dividing a number of old goats kept for slaughtering purposes, shearing part and allowing part to carry their fleeces through the winter. Two months after shearing the shorn goats were in the better condition.

The shearer should commence by first taking off the belly hair and between the thighs, which should be kept separate. Then place the shears close to the breast bone in the long neck hair, shearing up close to the skin, till between the jaw bones, clipping round close behind the left ear and passing round to the right, clipping regularly and closely from the left to the right side, avoiding any second cutting of the hair, and being careful not to mix up the fleece, but hand it up, as it comes from the goat, on to the sorting table, which should consist of an iron grating fixed in a wooden frame upon four legs, about the height of an ordinary table. The sorter and packer should then carefully open the fleece with the outside uppermost, keeping the neck to the left hand, and after beating all the dust and short hair out of it with the flat hand, first take off the stained breeching, placing it in No. 4 bag; next all the coarse and short in No. 3, then all the medium quality in No. 2, and lastly the superfine and full grown in No. 1

bag. After sewing up the bags, each should be marked on the outside as to its contents, with the producer's name or recognized brand.

CONCLUDING REMARKS.

In the foregoing abridged remarks on "goat-farming" everything has been said necessary to conduct it to a successful issue. But the enormous expense at present incurred will be saved when the Government pass what is known as a Compulsory Scab Act and a Compulsory Fencing Act. Until this has been done, all farming operations, even in the hands of the most enterprising men, must remain seriously handicapped. When these two Acts are in operation as safeguards to breeders, their stock will be able to roam day and night at pleasure, infection will be prevented, and trespassers excluded. Moreover, greater difficulty will be placed in the way of the South African stock thief; for being unable to move off in any direction he might choose were there no fences, he will, by their existence, be thus compelled to take the stolen stock through the gates, and by the main road.

XIX.

HORSE BREEDING.

By W. Grey Rattray, *Port Elizabeth, Editor of the "Racing Calendar."*

The original horse of South Africa would appear to have been a hardy, undersized, strong animal, presenting few qualities beyond endurance and strength.

Montgomery Martin, in that part of his history of the British Colonies which treats of the Cape of Good Hope, has the following observation respecting its horses:—"The horse is not generally large but it is extremely hardy. I have ridden one upwards of twenty miles without ever going out of a canter—the usual pace of the animal." A much fuller account of the Cape horse might have been given than this, and certainly something far more interesting.

Mr. Surtees, a good authority, tells us that at the time of the English occupation of the Cape in 1806, the breed of horses here was probably a cross between the Barb of Northern Africa and the Persian or Arab; the latter must have been introduced by the Dutch East India Company, but as to the time of the introduction of the former there is nowhere any record; still there can be no doubt that the Cape horse was in many respects Barb bred. In many points he yet resembles the horse of Spain, which partakes of an African origin, and in no respect does he more approximate him than in his paces—the amble and the easy canter are both alike.

Shortly after the English occupation of the Colony, the area of which at that period was circumscribed, the populated part being confined to the portion now known as the Cape Peninsula, the attention of the colonists was directed towards the improvement of the breed of horses, and it was during the administration of Lord Charles Somerset as Governor that the English thoroughbred horse was first imported. Lord Charles, like nearly every member of the great family from whence he sprang, was at heart a sportsman and passionately fond of the equine race. Sportsmanlike he was a genuine believer in the thoroughbred as the most useful horse for all purposes, and considered that he would be especially suitable

for begetting roadsters capable of accomplishing long journeys over the primitive roads then in use throughout the Colony. Having set his mind upon the improvement of the Cape horse by means of the thoroughbred, he was not long in putting his theory into practice, and an order for several sires of the best blood in England was at once despatched. I cannot definitely ascertain which was the first thoroughbred imported, and a perusal of the English Stud Book does not in any way assist me, although there I find that between the years 1811 and 1820, twenty horses and two mares left England *en route* for the Cape, six of the former of which died on the passage. Amongst the best known of the male gender, I may mention Claudio by Gohanna out of Belissa by Phenomenon, Cottager by Hambletonian, dam by Dragon, Bang Up (afterwards Shenley) by Young Sir Peter, dam by Tantrum, Merry Andrew by Dick Andrews out of Sister to Bangtail, Diabolus by Williamson's Ditto out of Magnolia the Younger, Kutusoff by Waxy out of Rival by Sir Peter, Cricketer by Sir George, dam by Ruler, David by Sir David, dam by Stamford, Yaffil by Popinjay, dam by Woodpecker, Pompey by Windle out of Anna Bella by Shuttle, Fascinator by Sorcerer out of Hannah by Gohanna, and Vanguard by Haphazard out of Vestal by Walton. The mares, of which I believe many descendants are still to be found scattered over South Africa, at the time of importation, were unnamed, being "Mare foaled 1801, got by Driver out of the Herod Mare, dam of the celebrated racers and illustrious sires, Precipitate and Gohanna," and "Mare by Haphazard, dam by Tantrum." Much good resulted from these importations not only in the immediate improvement of blood, but also in the general interest on the subject which was created. So satisfied were the colonists with the wisdom of Lord C. Somerset's idea of the thoroughbred as a sire, that the importation of these animals continued, and during the decade 1820-30 such notables as Skipper by Scud, Scipio by Filho da Puta, and Battledore by Sir Oliver, reached us. During 1830-40 these were followed by Protector by Defence, O'Connell by Young Emilius, Rococo by Cetus, Lindley (afterwards Discount) by Banker, Humphrey by Filho da Puta, Squirrel by Cain, &c. Most of these horses were purchased at prices then considered exceptionally high and now seldom heard of in connection with the purchase of horses for exportation here. Mainly owing to the enterprise exhibited by Mr. T. B. Bayley, an eminent colonist,

whose loss we have great reason to deplore, the import trade improved both in numbers and class during the succeeding ten years, 1840-50, the roll for which may be set down as the best of all time. It included a large number of stallions, who for years had been standing at the public service in England. Many of this number, besides possessing undoubted merit as race-horses, had in England sired horses that subsequently became famous, and the pedigrees of some of these sires crop up in the genealogy of many well-known English race-horses of the present day. The selected of the sires imported during this period may be set down as Tally Ho by Emilius out of Misrule by Merlin, Gorhambury by Buzzard out of Brocard by Whalebone, Orion by Bay Middleton out of Silvertail by Gohanna, Ruff by Jerry, Flytrap by Bay Middleton, Moscow and Middleham by Muley Moloch, Peter the Hermit by Gladiator, and Evenus by Alpheus. Prior to his purchase for exportation, the last-named horse was the property of the then Earl of Stradbroke, and had carried his Lordship's colours to victory in such eminent contests as the Royal Hunt Cup and the Cambridgeshire. Middleham won the Liverpool St. Leger, and all of the other horses mentioned were winners of note. Prominently amongst the younger horses imported in this famous decade, shine out such worthies as Sponge (sire of Express), Winchelsea, Fancy Boy, Seth, Eleusis, Bramble and Sir Launcelot. The notables among the mares included Astra by Astrachan, Mare by Almack, subsequently named Camelina and dam of Express, Post Haste by The Colonel covered by Jereed, Georgian by Buzzard out of Variety by Selim, and Taffrail by Sheet Anchor, dam by Whisker. The two mares last mentioned were covered in England by Sir Hercules, the sire of Birdcatcher, and to him Georgian dropped a colt foal which was subsequently named Sir Hercules. This colt afterwards became famous as a sire, his name frequently occurring in the pedigrees of horses bred in the Hantam.

Business did not slacken during 1850-60, and the quality, although not quite up to that imported in the preceding decade, was still commendable. The importations included Pantomime by Pantaloon, Lammermoor, Cockermouth and Mr. Martin by Lanercost—the last-named described in the *Sporting Magazine*, the recognized authority of the day, as one of the handsomest horses England ever produced—Cornboro by Flatcatcher, Mayor of Hull by Shawn Buidhe, Wrestler by Orlando, Berkeley by Teddington, Sylvan by The Saddler, Early Morn by Chanticleer, Saraband by Cother-

stone, Wentworth by Bay Middleton, and Mortimer by Fitz Allen. The last-named horse was the first thoroughbred imported into Natal. The best known of the matrons were Meliora by Melbourne, Georgie by Orlando, Idolette by Storm, and Hebe by Herbalist.

1860-70 brought a large number of horses to our shores, the most prominent being Bonnie Morn by Chanticleer, Nothing More by Hospodar, Commissioner by Orest, King William by Poynton, Naughty Boy by Idle Boy, Newsmonger by Newminster, Nugget by West Australian, and Tormentor by Wild Dayrell. Tormentor was exported from England to Mauritius, and afterwards exported from that Island to the Cape.

About the year 1870 the attention of certain unscrupulous speculators was directed to the desire on the part of our Dutch farmers to possess imported stallions, and in consequence numbers of the sorriest rips that ever escaped the knacker were imported. These horses were selected by the speculators to gratify their customers' predilection for animals endowed with small heads, pointed ears and peacocky carriages, with an utter disregard of bone or general conformation. During the sixteen years from 1870 till the present time several hundred animals of this class have been imported, most of which were purchased at Tattersall's for a few guineas, brought out here and sold for half as many hundreds. An instance is on record of a horse purchased at public auction in England for five guineas being sold here for £500. I do not think I am wide of the mark when, leaving out the best known and valuable stallions imported privately, I assess the average price paid for the remainder as fifty guineas. A perusal of the English blood stock sale returns shows that the majority of those imported which were sold publicly did not realize anything like this sum, the range, as a rule, being from three to twenty-five guineas. Independent of the Speculator brand of thoroughbred, there were many good horses imported during the period named, and I select from the list a few deserving of special mention, viz., Belladrum, Champagne Charlie, Buxton, Erl Koenig, Moorfoot, Elf King, Sir Marmaduke, Plunger, Student, Catalpa, Monk, St. Augustine, Sportsman, Fire King and Whackum.

Having now traced the history of the South African horse from the earliest period, I must hark back and discuss his merits after the introduction of the thoroughbred. Prior to the English occupation, but little is known of the horse further than what is stated in the opening paragraph

of this paper. It may interest colonists to learn that the first horses imported into Australia were from the Cape, produced by the thoroughbred stock imported here about 1810 from the common mares of the country. These animals appear to have been got without selection, and to have been but sorry brutes. Atkinson, writing in 1824, says of them:—"They are but nags in size and bred without much care; by no means sightly in appearance, being narrow-chested and sharp-backed as well as deficient in the quarters. They have an incurable habit of shying and are by no means surefooted." This description would doubtless equally apply to the Cape horse of the year 1815 or thereabout. Ten years later, however, a vast improvement had been effected in the general quality, and about the year 1825 the Cape horse was sufficiently attractive to provoke the admiration of the lordly but debilitated Indian Nabobs, who at this period flocked in large numbers to the Cape, then highly esteemed as a health resort, and many horses were taken to India as hacks and chargers by the recruited health-seekers. For these the Nabobs, who were always lavish in dispensing the golden Mohurs, paid very high prices, and they being the best of their class, and able to stand the trying Indian climate much better than the English-bred horse, soon attracted the attention of the Indian Government authorities to the advantages of the Cape as a field for procuring remounts from, and in 1835 a small trade was opened up which bade fair promise of yearly increasing in magnitude. An eminent veterinary authority, in writing of the Cape horse of the period 1850-1860, says:—"In its breed, in its shape, in its colour and in its temper, the horse of the Cape is very different from the English horse of any kind. A century ago possibly the difference was greater even than it now is; but since the time when Lord Charles Somerset was Governor of the Colony, the old Arab blood has been more mixed with English than it was previously; and now that the best of English blood is being yearly imported there, it may be expected that in time the peculiarities of the Cape horse will disappear, and, as has been the case with English horses, from an admixture of blood, something excellent in its kind will be at length obtained. It is in shape and make, or what are termed the good points of a horse, that the Cape horse is so far inferior to the English. Such a thing as good fore legs are very rarely seen in the Colony; yet this might easily be amended were more care taken of the horse when young. A most detestable practice, termed kneehaltering, is in vogue, which

cannot be too strongly condemned, as it decidedly cripples a horse in his fore legs. A horse subjected to this practice for a few months will be a stumbler to the end of his days. To add to this defect, the probability is he has a heavy straight shoulder—nothing is more common amongst all, even the best, Cape horses. The principal imperfection of these animals is without doubt their fore legs; a good thighed horse may often be met with, but a long arm, with a short, good leg, rarely."

About 1840 the South African Turf Club was founded, and I was recently favoured with a copy of the programme of its Autumn Meeting, held on the Green Point course in April, 1845. In the list of Stewards I was pleased to observe the name of the present genial Usher of the Black Rod, Mr. M. Blake, who I think is the only living representative of the early Cape School of Sportsmen. The programme in question compares favourably with the latter day programmes of this same club, being almost as valuable. In 1845 the principal race was the Produce Stakes, for three year olds, and its value was £360. It was the introduction of this race which held the same reputation in Cape Town that the Epsom Derby did in England, that gave the extraordinary fillip to the importation of sires of exceptional merit. No matter how much racing is decried by that class designated the respectable, and how much it is alloyed with numberless objectionable concomitants, it must be tolerated and nourished as a means to an end, viz., the improvement of the breed of horses. Shape and pedigree can be judged by observation and research, but competition is the true and only test of speed and stoutness, and it is by that means alone that the breeder can determine whether or not the young colt is possessed of sufficient merit to be in after years advanced into the position of a lord of the hara. Again, racing is the only true test of individual sire's produce, and is a certain guarantee of the maintenance of a high standard of excellence in our horses. Stonehenge, one of the greatest living authorities on the horse, says: "If racing was not encouraged we would soon find the thoroughbred disappearing altogether." The formation of the South African Turf Club with its biennial gatherings soon demonstrated to the Cape breeders the value or worthlessness of the stock they were breeding from, and from the year 1840 to 1860 a considerable improvement was effected in the general Stock of the Colony.

It may be said that the Cape horse, taken generally, reached the highest state of perfection it has yet attained during

the decade 1850-60, and it was during this period the Indian authorities appointed a resident commissioner at the Cape for the purchase of horses suitable for remounts. This office was filled by Lieut.-Colonel Apperly, and this able officer and most efficient judge was thoroughly satisfied with his purchases, and was much impressed with the value of the Cape Colony as a horse breeding country. In an address delivered at Cape Town on the subject of horse breeding, this gallant officer, after pointing out the great capabilities of the Cape as a horse breeding country, went on to say:—" Every shoulder should be put to the wheel to improve such a wonderful and only half-developed country. Horse sickness can be avoided by erecting proper sheds for the mares and foals, and growing fodder of some sort, roots or cereals, to feed them on during the prevalence of the disease. If the farmers do not think their horse stock worth this little expense and trouble, they deserve to suffer, and the Australians will ultimately deprive them of the Indian market." Some idea of the value of the export horse trade carried on during this period may be gathered from the following statistics given by Colonel Apperly prior to his departure for the East:—" Since the outbreak in India became known, 5,482 horses and 108 mules have been shipped to Calcutta and Bombay, and the following large sums of money have been disbursed amongst the farmers of the country and speculators, who are all more or less cultivators of the soil:—Paid for horses, £156,853; for mules, £2,145; for forage, £47,265; for keep of horses on farms, £9,382; in all £215,645. This large sum is exclusive of shipping charges, servants' wages, and horse gear of different sorts." The only complaint Colonel Apperly had against the Cape horse was want of size, consequent on the mares and foals being starved during droughts, and having no protection from the cold experienced during the winter seasons. During all his peregrinations he never saw a spavined horse, but curbs often; and yet—will it be believed?—the removal of such things by the iron is still unknown; and as to firing, if it has been ever heard of by the farmer it has assuredly never been attempted.

The departure of Colonel Apperly practically extinguished the Indian trade, as the breeders were not sufficiently enterprising to follow it up by exporting private batches, and a large annual revenue was thus lost to the Colony. This is the more to be regretted when it is considered that the Cape horse was eminently suitable for the required purpose in every point except size, and this could easily have been remedied

by a little attention. A proof of the excellency of the Cape horse for military purposes was afforded when the Crimean War broke out. Several of the Cape horsed cavalry regiments then located in India were ordered to Russia, and the hardy Cape horses acquitted themselves admirably in that most trying campaign. A very high tribute to the Cape horse of this period was recently paid by an old Indian officer in writing to the *County Gentleman* on the much discussed subject of the superiority of the Australian over the English-bred horse. He says:—"I still adhere to my previously-expressed opinion that whether as a racer, hunter, charger or draught horse, the English-bred animal is superior to his Australian contemporary, although I will not deny that the latter may stand the Indian heat better. For a good all-round horse, capable of standing hot and cold weather in the open and keeping his condition through it, recommend me to the stamp of horse that was imported from the Cape during the Mutiny. With a favourite charger who came from that part of the world, where he had been purchased in the ordinary way as a trooper, I rode 120 miles inside 14 hours, and I am perfectly satisfied that my gallant steed could have gone on for three or four hours more without knocking up. As an all-round horse he was a marvel, being an irreproachable charger and perfect in harness. During an up-country residence I put him in training for a garrison race meeting, and he won everything he started for, both on the flat and over timber. He repeated this performance about a year afterwards in Ceylon, where, during my residence, he was absolute cock of the walk."

Since Colonel Apperly's departure little has been done by our breeders to re-establish the Indian trade, and still less to remedy the want of size complained of by that officer. In all the Colonial wars this has also been a complaint regarding the Cape horse. His capability in point of endurance, and all other points except size, has been such as to call forth the highest encomiums from many leading English cavalry officers. In the Zulu war thousands of South African-bred horses would have been used had he been of sufficient size. In the Basuto war nothing else but home-bred horses were used, and they proved admirably suited for the purpose, failing only from want of size where they had to carry extra heavy burdens. During the recent Bechuanaland campaign a large number of home-bred horses was purchased on account of the Imperial troops. The purchase of these animals was entrusted to a speculator, who in turn sublet small contracts to individuals in the different districts. The

last-named were set a limit as to price, about half the sum the chief contractor was receiving from the Imperial authorities, and in consequence they were unable to procure the best animals. I do not hesitate to assert that had trustworthy agents been despatched amongst the horse-breeding farmers to purchase troopers at the price the Imperial Government paid the speculator, a sufficient number of animals equal to the work required from heavy Dragoon troopers could easily have been procured. As it was, the horses purchased were anything but creditable to South Africa as a horse-breeding country, and militated seriously against its capabilities in that respect in the opinions given by the officers engaged in the campaign in answer to the circular addressed them by H. E. Sir Hercules Robinson, requesting information as to the suitability of the South African-bred horse for Cavalry and Artillery purposes in India. This circular was sent out by His Excellency at the request of the Port Elizabeth Agricultural Society, which was desirous of seeing the patronage of the Indian authorities extended to South Africa for portion of their remount requirements for Cavalry and Artillery purposes. It was mainly owing to the adverse opinions received from the officers as to the size of the South African horse that the matter was not prosecuted further, and the want of size in the horses purchased for the Bechuanaland expedition is solely attributable to the greed of the Government contractor and his satellites. In the opinions received, Col. Curtis, commanding 6th (Inniskilling) Dragoons, says:—"I am unable to speak favourably of the class of horse to be found in the Cape Colony. I have purchased about seventy remounts for the regiment under my command, and am of opinion that they are light, undersized, and not up to the weight they have to carry. Of those chosen and bought only seven (the best) were taken, and even these were of an inferior class for cavalry service. The horses purchased by the Remount Committee for the Bechuanaland Field Force (mounted infantry and mounted rifles) averaged 14 hands 2 inches in height, and were, as a rule, lightly built. In my opinion the deterioration in quality and size of the Cape Colony saddle horse during the last fifteen years, is owing to indiscriminate breeding, a want of care in the selection of suitable sires and dams, careless rearing, and want of protection of the young during the inclement season. Breeding indiscriminately through some thoroughbred stock produces the many weedy horses to be seen."

The Hon. Paul Methuen, Colonel 1st Mounted Rifles, says:—"So far as I can judge I entirely agree with Colonel Curtis, and do not believe the Cape horse equal to the weight of a cavalry soldier and kit. Not overweighted and not overpaced, it is a marvel to me what work these horses can do, animals with scarcely a good point to recommend them."

Colonel Carrington, 2nd Mounted Rifles:—"I consider it very doubtful whether any number of horses could be obtained in the Cape Colony, suitable for English cavalry in India. As a rule, the horses in South Africa are too light and undersized for cavalry purposes, and when sufficiently strong to carry the weight are too often coarse and underbred. The Cape horses are without doubt hardy and tough and of great endurance, and being very tractable are I consider well adapted for mounted infantry or mounted riflemen."

Major B. H. Martin, commanding 3rd Mounted Rifles, says:—"The horses received from the Remount Depôt for this regiment are not up to the weight of the cavalry soldier in marching order (over 18 stone even in light cavalry). The Indian climate, I think, would suit them, and, if a very judicious selection were made, they would be suitable for mounted infantry in that country, and would be especially suitable for native cavalry, who generally are lighter men and carry lighter equipment. The rank and file of native cavalry used to supply their own horses. I do not know if this is still the case, but if horses are now supplied by Government I should think these horses would be most suitable. Horses such as a few of the very best of those we have might possibly carry the cavalry soldier of the line, but taking them as a whole, I could not recommend them for that purpose."

It seems therefore that the South African horse of the present day in a general sense is inferior to that of a quarter of a century ago. For the reasons annexed to this we have not to go far to seek, they being all attributable to the introduction of the Speculator brand of thoroughbred and indiscriminate breeding.

Few parts of the world are so well adapted by nature for the breeding of horses as the Cape Colony and the conterminous independency, the Orange Free State; and it is surprising that this industry, the most fascinating and profitable branch of pastoral farming, is not pursued on more defined lines by our landowners. The unsophisticated Boer will tell you that horse breeding does not pay, nor will it ever while

it is pursued in the listless, haphazard fashion it is now. To make it pay and pay well it must be conducted on sound principles. No matter for what purpose the breeder is breeding, be it for racing, saddle, draught, remount or artillery, a certain amount of care and attention is necessary, especially in the selecting and mating of the sires and dams. With this given, and average seasons favouring the breeder, horse breeding will pay better than either sheep, goat or ostrich farming, as the markets of the world are open to the Colony, and there is an unlimited demand for horses at remunerative prices in Europe and India, which at any time is likely to be increased in an alarming degree in the event of a European war breaking out. At the present time the country is fairly overrun with horses for which no market can be found, principally owing to the inferior character of the article. That this is so is evidenced by the fact that any decent looking horse of any size, broken or unbroken, offered at an auction market still commands a good price, and bad as the times are it is extremely difficult to pick up a moderate horse for anything under £20. That good serviceable animals, eminently suited for cavalry remounts, can be obtained in the Cape Colony was proved to the writer on the occasion of a recent visit to several of the large breeding establishments, but unfortunately their individual owners are not possessed of them in sufficient numbers to warrant their exporting, nor do they care to part with them at the unreasonable figure offered by the speculator. What is required in the first instance is a breeders' society, which, besides looking after the general welfare of horse breeding, would undertake the exportation of suitable animals. A lengthened correspondence on the subject of the exportation of horses has for some time back been carried on in the columns of the *Racing Calendar*, a paper which from its foundation has strongly advocated the resuscitation of the Indian trade, and recently a writer in that journal suggested that in order to thoroughly test the matter, a small limited company with a capital of £2,000 should be formed. The suggestion is a thoroughly good one and highly worthy of being adopted. Surely we can find a couple of hundred men interested in the breeding of horses, possessed of sufficient public spirit to lay out £10 each for the purpose of practically testing what may, and very likely will, ultimately prove an annual mine of wealth to the Colony? We see from Col. Apperly's statistics what we have lost. At the present day the Indian demand is greater than ever, and

£1,250,000 may be set down as a fair computation of the amount annually expended by the Indian authorities in the purchase of imported horses, and a considerable portion of this sum could by judicious management be diverted into the pockets of the South African breeders. Nearly all this money goes to Australia, a continent indebted to the Cape Colony for the first horses that ever trod its earth. It seems more than strange that a country so much younger than ours, and with no greater natural advantages, should cut us out of the Indian trade. In 1880 Col. Apperly, in tendering an advice to our breeders to take care of their young stock, warned them that if they neglected this advice they deserved to suffer, and the Australians would deprive them of the Indian market. How prophetic this utterance was we have seen, as for years past not a single Cape horse has been exported to India, which, as before stated, is now almost wholly supplied from Australia, and fears are entertained at the Indian head quarters that that Colony, great although her resources are known to be, will be unable to keep up the supply if a European war breaks out. That the fears are reasonable cannot be denied, as war in Europe would drain every country of its horses, and the combatant paying the best price would have the best mounted cavalry.

Had our farmers only followed the excellent advice tendered by the last Indian resident commissioner, the Indian trade would never have left us. The Australians soon found out the class of horse wanted for the Indian market, and bred to produce him, remedying each defect discovered by every means in their power. On the other hand, our breeders pursued their avocations in a listless, haphazard fashion, and paid no attention to the oft reiterated warning that the stock they were breeding was deficient in size, and it is chiefly owing to the careless apathy displayed that we owe the loss of our export trade. In the course of my wanderings in South Africa I have been privileged in visiting many of the best known breeding establishments, and although in several a little system prevails, the greater number are carried on without the slightest regard to even the rudimentary principles. In many instances I have regretfully noticed the mating of fine mares admirably adapted to breed remounts from with trashy stallions of the Speculator brand, whose great recommendation in the eyes of their owners was the small head, pointed ears and arched neck.

Before entering upon the subject of breeding, it may be advisable to mention the districts of South Africa best

adapted by nature for its profitable pursuit. In the West, Caledon, Swellendam, and the famous Bokke Veldt would be most suitable; and in the East, Somerset, Cradock, Tarkastad, Middelburg, Colesberg, Albert, Dordrecht and all the country to the East; also Griqualand West, and the greater portion of the Orange Free State. These districts enjoy comparative immunity from the ravages of horse disease, grass is plentiful in the spring and summer, and could by the erection of silos be conserved for use during severe droughts. It may not be out of place here to suggest that the Government should print in book form, in the English and Dutch languages, and circulate amongst our farmers, the admirable notes on the stock diseases of our country, and the means for their prevention, compiled by the Colonial Veterinary Surgeon, Mr. D. Hutcheon, than whom no better authority on the subject could be found.

In the selection of a farm for horse breeding nothing can excel a limestone formation, as the water on farms so situated, if river or spring water, contains a due proportion of the phosphates that tend to the natural development of bone. Low, marshy situations are unfavourable to the constitution of the horse, and tend to make him coarse, unwieldy and generally unsound.

With the proper farm selected and thoroughly enclosed, for this is a *sine qua non* in practical and successful horse breeding, the breeder must see that proper accommodation is provided for his stallions, and adequate shelter for the mares and foals during the cold winter nights. It will scarcely be credited what shelter alone during the winter nights will do for the improvement of the size of the young horse. An idea prevails that if a young horse is well fed he will withstand the most inclement cold. In a sense this is true, for he will if well fed withstand the cold, but he will never grow in it, and, as previously demonstrated, size is what we principally require. It follows that shelter for mares and foals is essential. It is surprising how well young horses will thrive on the veldt in very trying winters if they are only sheltered during the nights, even if the shelter is the primitive bush hovel. In the selection of a farm the breeder should endeavour to obtain one abounding in vleis, as in summer the succulent grasses that grow in these oases could be reaped and conserved for winter use.

The best stamp of horse to start breeding is a horse suitable for the Indian trade, as troopers are equally valuable for the ordinary saddle and draught purposes of the country. I gather from the *Racing Calendar* of July 22nd that what

the Indian authorities require is as follows:—Height not under 15 hands; age from 4 to 7 years, broken or unbroken, the latter preferred; for Dragoon horses blood power and good bone are essential; for Artillery bone power and as much blood as possible; mares and geldings only taken, the latter preferred. The price for suitable animals delivered in Calcutta, Bombay or any other Indian seaport ranges from £50 to £60 per head, and the expense of transporting a horse thither I have ascertained to be under £9, so that £46 can be reckoned as the average price in Cape Town, Port Elizabeth, East London or Natal. From the same paper I also learn that the Indian authorities are most anxious to open up a trade with the Cape, and if one or two favourable shipments were made it is believed they would appoint a resident commissioner to take over horses in one of our seaports.

There are thousands of mares in this country specially suited for breeding remounts from, and I do not think any breeder will experience much difficulty in picking up say a hundred of them at £15 per head, and they are dirt cheap at that price, as many of the mares I have seen recently sold at or about that figure would realize it quite three times at Horncastle or any other great English fair. In selecting the mares it is essential to choose only those having not less than three direct infusions of imported thoroughbred blood in their veins. They should likewise be young, and all those who have ever been mated with a donkey should be passed over, as asinine attributes will attach to their succeeding progeny even if got by a thoroughbred horse. In height the mares should be quite 15 hands high, with large barrel, strong back, long and broad quarters, muscular thighs, large boned hocks, well set back shoulder, strong forearms and plenty of bone below the knee, 7½ inches girth being the minimum in the last-named respect. No mares, if suitable in other respects, should be rejected on account of possessing plain heads, although lean, bloodlike heads and well-shaped necks are a recommendation. No commissioner will reject a horse on account of his head alone, and it should be remembered by all lovers of horseflesh that as a rule small heads denote cunning. To breeders already possessed of mares built on smaller lines than those I have laid down, and with sufficient blood, I should advise the purchase of a Norfolk roadster to mate with them, as he would be likely to get many horses suitable for remounts, and his fillies when crossed with the thoroughbred would produce the exact article required.

For sires the experience of the breeders of the world has

proved that nothing beats the thoroughbred English horse, and for the purpose of getting remounts from the Colonial mares above described a thoroughbred of the stamp used in England for the begetting of hunters should be acquired. that is, a horse standing quite 16 hands high with great power and bone. He should be strong enough to carry 16 stone over any country, and his stoutness should if possible have been proved by the usual test of his having carried heavy weights to victory over a trying course. A horse of the required character could not be obtained in England for less than five hundred guineas, and at the present time we have very few stallions in South Africa at all suitable for the purpose. To select the most suitable from amongst our living sires I should choose Buxton, Elf King, Fire King, Catalpa and Harkaway, all of which are possessed of the required substance, and the two first-named have the additional merit of their stamina having been attested in many a hard fought race. There are several other sires in the country of substance enough, but I would not recommend them on account of bad legs or some other equally fatal point. As a whole, the class of stallions in use throughout the country is a disgrace, and I should like to see nine-tenths of them handed over to the Vet for addition to the list. It is imperative that a stallion should receive a certain amount of daily exercise, and this, I regret to say, is seldom accorded to our sires, who, as a rule, are cooped up in a box from year's end to year's end, and only breathe the fresh air when brought out for covering purposes. A few months ago I saw a valuable stallion who had not been outside of his box for over eight months, and I do not think the box had been cleaned out for a like period, as the litter was over the horse's fetlocks, and his feet had grown quite a foot long. The owner of this horse was rather proud of him, and in reply to my query as to why he did not look better after his comfort, said "A stallion is all right so long as he is well fed." Never was greater mistake made. A stallion's comfort should be as thoroughly cared for as a racehorse in training. He should be properly groomed twice a day, his feet kept in perfect order, and each day should receive two or three miles of walking exercise, with a gentle canter of a mile once a week. In this country a mistaken idea exists that a stallion should always be grossly fat. Melbourne, one of the greatest thoroughbred sires of all time, when fat was impotent, and many other similar instances are on record. All things equal, stallions accustomed to daily exercise will beget better stock than

those cooped up. Experience proves that mares exposed to the vicissitudes of the weather, if [illegible] experience [illegible] and [illegible], misshapen [illegible]. An impression [illegible] in some quarters that the Arab horse is the correct thing for a South African stallion, but experience teaches us that he [illegible] for many generations, and cannot at all be compared with the English thoroughbred. Again, the size of the Arab horse, which seldom exceeds 15 hands, would militate seriously against him, as we particularly want size, and cannot look to obtain it from the use of an undersized horse.

Having secured a suitable sire and a complement of the mares already described, the next thing would be for the breeder to start a Stud Book, in which he should enter alphabetically the name of every mare he possesses, with full particulars as to where she was bred and the full extent of her pedigree that can be obtained.

When the covering season comes round, every time a mare is covered an entry of the date should be made in the Stud Book, as thereby the breeder would be enabled to ascertain the expected date of each foaling, and, in order to prevent accidents, could have the mare brought into the homestead during the foaling week. Immediately the foal is born an entry of the date of birth, sex and markings of the foal should be made.

Large camps, capable of supporting twenty mares each, should be constructed, converging towards the homestead; and the hovels, which can be very cheaply constructed of wattle and daub, should be placed as near the homestead as possible. Each mare should have a separate hovel (although the full complement can be built in a row), which she will soon learn to know if she is fastened up every night for the first two or three weeks of her residence on the farm. During the summer months she can run night and day, but as the winter comes on she will surely find her way at sundown to the hovel which sheltered her in the preceding cold season, and during severe droughts she should be fed in the evening in the hovel. When the foals are weaned, the colts, unelss thoroughbred and tracing back to the English Stud Book, should be castrated. The present fashion of keeping all colts with any pretensions to breeding, entire, is one that cannot be too severely condemned. Many of the undersized, weedy-looking brutes we see disgracing our country owe their exsitence to colts of this description being left entire and covering mares

while about eighteen months old and running alongside of their dams. The thoroughbred entire colts when weaned should be allotted a separate camp in which to run in the daytime, and be stabled and fed every night; and any of them when three years old or earlier, showing signs of bad legs, weak loins, or any other deformity, should be at once subjected to the knife, no matter how well bred he is, for blood must always be sacrificed to shape. Horse breeding will pay and return extraordinary interest for the money invested if pursued on the foregoing lines, even if every mare on the farm is fed nightly during droughts. Feeding sufficient can be obtained by reaping the surplus grass in bounteous seasons; and crops of roots, such as Mangold Wurzel, can be grown with little expense on any farm possessing a plentiful water supply.

While our breeders refuse to pay attention to their studs, and mate their mares to any stallion so long as he is thoroughbred, they will find horse breeding an unprofitable pursuit. On the other hand, those who pursue the industry on the lines laid down will soon prove, by the prestige gained by their stock and the balance at their bankers, that attention is the ladder to success.

At present the majority of our horses are miserable weeds, and their successors promise to be still further useless, through the indiscriminate use of miserable stallions, whose only recommendation is a high sounding, flashy pedigree, with possibly the additional incentive of having won a race where the animals he encountered were, if possible, worse than himself.

In Germany the Government is proprietor of a large number of high class, specially selected stallions, picked principally for their likelihood to beget cavalry horses. These horses travel about and serve farmers' mares at the low fee of 5s. per head, upon condition that the Government has the right of purchase of the produce at a fixed sum at three or four years old. If the Government of this Colony could see its way to introduce some plan of this kind, the former prestige of our horses would soon not only be restored but improved upon.

I have long been of opinion that our Government should in some central part of the Colony found a gigantic Stud Farm where horses, cattle, goats, sheep and asses could be bred for sale for stud purposes. The institution of a farm of this description would prove the making of the pastoral industries, as Government could place a ban upon the importation of all stock which could not pass the inspection

of a competent official. Naturally, rather than incur the chance of their imported stock being condemned, our farmers would purchase their changes of blood at the Government Stud Farm, where the rule of the survival of the fittest in the state they were born should be rigidly carried out, the knife being ruthlessly applied to all weedy and inferior lots. At the outset a farm of this description would not prove remunerative, but even if by its institution the country lost £10,000 a year for a few years, it would be money well expended. Ultimately, when its object became appreciated, it would become self-supporting.

Another method to improve the breed of horses would be the imposition of a tax on stallions, but I am afraid that any attempt in this direction would be hopeless, as our farmers are too short-sighted to perceive that the tax would in time become a benefit.

The Jockey Club of South Africa, founded in 1882, is beginning to make its power felt in the land, and the many valuable stakes offered at the race meetings held under its auspices will have a wholesome effect in tending to improve the breed of horses. I notice that a Derby of the value of £400, for South African-bred three year olds, was run for the first time at Port Elizabeth in October last, and won by a colt whose shape will compare favourably with that of even the best horses in England. This Derby promises to become an annual institution, and its effect will be duly felt, as also will that of the other valuable races offered at the Jockey Club meetings. One of these, to be decided at Kimberley in October this year, is of the value of £750, and I am informed this is the most valuable stake ever offered in South Africa. For several years back the racing at Cape Town has not been quite what it might have been, and doubtless this has had a depressing effect upon breeders in the Western Province. However, I learn that a step in the right direction has been taken, the two Clubs existing in Cape Town having amalgamated, and the race meetings of the future promise to outrival any of their predecessors. Before leaving the subject I would recommend the Executive of the Amalgamated Cape Town Clubs to discountenance the continuance of pony, galloway, and other such like races on their programmes. The Government might assist the Jockey Clubs in their efforts to improve the breed of horses by giving annually three plates of the value of one hundred guineas each, to be competed for at Cape Town, Kimberley and Port Elizabeth by horses bred in South Africa.

Other countries may compete and beat us out of the field with wool and mohair, and ostrich feathers are articles subject to the caprices of the leaders of fashion, and consequently liable to serious fluctuations in price; in fact it is within reason to assert that at any moment the leaders of fashion may set their ban upon ostrich feathers and thereby effectually crush the industry. A large and continuous demand exists for good horses, and no country in the world is better adapted for their breeding, nor anywhere can they be reared more economically than in the Cape Colony, where the dreaded disease of roaring is unknown and horse sickness seldom prevails. In a well-regulated stud I question if the last-named disease would ever be heard of.

A great and profitable industry is horse breeding, and it only wants opening up to become a source of wealth to the country generally, and in the interests of the people it behoves the Government to encourage the industry by every means in its power.

[NOTE.—Colonel Curtis writes:—"I return the essay. I think there is nothing to be added to the very full report which it contains, and the excellent suggestions which are offered. As far, however, as the General's and my memory serve, the 10th Hussars, when they landed in India, were mounted on Arab stallions, and, to the best of my recollection, the 12th Lancers also."

Mr. Blake says:—"In Sir Benjamin Durban's time Colonel W. Havelock bought, through me, a number of Cape horses, which were sent to Bombay. In 1846 I bought about four hundred horses *in a week* for the Kafir War. In both cases most of the horses were *very fine*. A great many of the horses sent to the Frontier were afterwards taken to India and highly approved of there. Up to a comparatively recent period it was not difficult to obtain a large number of good horses in the Roggeveld and other parts. Many of the large farmers in the Western Province in former times had as many as 300 mares. I attribute the falling off to the slackening demand shortly after the period spoken of by the author, owing to deterioration in quality, and the pastures being taken up for the more profitable business of Merino sheep farming, causing farmers to neglect this important branch of farming. There can be no doubt that this is *a great horse country*, and might produce any number of good horses. If time would permit, I could add a good deal more about the early days of horse breeding at the Cape."]

APPENDICES.

APPENDIX I.

PRESIDENT, PATRONS, VICE-PRESIDENTS AND COMMITTEES, &c.

PRESIDENT :

His Excellency the Right Hon. Sir Hercules G. R. Robinson, P.C., G.C.M.G., Governor of the Colony of the Cape of Good Hope and Her Majesty's High Commissioner.

PATRONS :

His Excellency Sir Henry E. Bulwer, G.C.M.G., Governor of the Colony of Natal ; His Honour Sir John Brand, G.C.M.G., President of the Orange Free State , His Honour S. J. P. Kruger, President of the South African Republic ; Lieut.-General the Hon. Sir Leicester Smyth, C.B., K.C.M.G. ; The Admiral Commanding the Station ; His Honour Sir Henry de Villiers, K C.M.G., Chief Justice ; The Hon. Mr. Justice Dwyer, LL.D. ; The Hon. Mr. Justice Smith, LL.D.; His Honour Sir J. Dirk Barry, Knt., President Eastern Districts Court ; His Honour J. Buchanan, Judge President High Court, Kimberley ; The Hon. Mr. Justice Shippard, D.C.L. ; The Hon. Mr. Justice Buchanan ; The Hon. Mr. Justice Laurence ; The Hon. Mr. Justice Jones ; Sir David Tennant, Knt., Speaker of the House of Assembly ; The Hon. T. C. Upington, M.L.A., Q.C. ; The Hon. J. G. Sprigg, M.L.A. ; The Hon. Jonathan Ayliff, M.L.A. ; The Hon. F. Schermbrucker, M.L.C. ; The Hon. J. A. de Wet, M.L.A.; The Hon. Sir T. C. Scanlen, K.C.M.G., M.L.A.; The Hon. J. X. Merriman, M L.A.; The Hon. J. Sauer, M.L.A.; The Hon. J. W. Leonard, M.L.A., Q.C.; The Hon. Cecil J. Rhodes, M.L.A.; The Hon. C. W. Hutton ; The Hon. Sir J. Molteno, K.C.M.G.; The Hon. Dr. White ; The Hon. Chas Brownlee, C.M.G.; The Hon. William Ayliff, M.L.A.; The Hon. J. A. Laing, M.L.A.; The Hon. J. H. Hofmeyr, M.L.A.; The Hon. Charles Abercrombie Smith ; The Chairman of the Chamber of Commerce, Cape Town ; The Chairman of the Chamber of Commerce, Port Elizabeth.

VICE-PRESIDENTS :

The Mayor of Port Elizabeth ; The Civil Commissioner and Resident Magistrate of Port Elizabeth ; The Hon. John Miller, M.L.C. ; The Hon. Alfred Ebden, M.L.C. ; The Hon. Dr. Atherstone, M.L.C.; The Hon. H.W. Pearson, M.L.A.; Charles T. Jones, Esq., M.L.A.

GENERAL COMMITTEE :

J. Brister, Esq. ; S. D. Bairstow, Esq. ; E. Castens, Esq. ; H. B. Christian, Esq. ; P. W. Court, Esq. ; H. W. Dalldorf, Esq. ; R. Davidson, Esq.; C. R. Deare, Esq.; Major Deare, P.A.G.; H. Dedicke, Esq.; A. Dickson, Esq.; M. Dold, Esq.; Dr. Ensor ; S. H.

Farrar, Esq.; V. Folkes, Esq.; J. P. Ford, Esq.; Peter France, Esq.; The Hon. J. Geard, Esq., A. Gloag, Esq.; James Gordon, Esq.; E. W. Gough, Esq.; T. Griffiths, Esq ; R. Hallack, Esq.; C. Hannam, Esq.; J. A. Holland, Esq.; W. Hume, Esq.; Geo. Impey, Esq.; C. T. Jones, Esq., M.L.A.; W. Jones, Sen, Esq.; M. Joseph, Sen., Esq. ; J. T. Keith, Esq.; D. Kemsley, Esq.; J Kemsley, Esq.; J. C. Kemsley, Esq.; Robt. King, Esq.; J. S. Kirkwood, Esq ; H. C. Klippert, Esq.; M. M. Loubser, Esq.; Chas. Lovemore, Esq., James Lamb, Esq ; Charles Lee, Esq. ; A. Lehmann, Esq.; J. M. Leslie, Esq.; H. C. Leslie, Esq.; Joseph Lewis, Esq.; A. Lipman, Esq.; J. G. McFarlane, Esq.; J. Mackay, Esq.; A. E. Marks, Esq ; Wm. McFarlane, Esq.; J. McIlwraith, Esq.; W. H. Miles, Esq , A. R. Orpen, Esq.; H. W. Pearson, Esq., M.L.A. ; John W. Philip, Esq ; A. H. Reid, Esq.; S. Rous, Esq.; M. G. Salomon, Esq.; W. Savage, Esq ; Dugald Sinclair, Esq.; J. F. Smith, Esq., G. W. Smith, Esq.; C. Soderberg, Esq.; H. H. Solomon, Esq.; A. R. Steele, Esq.; Dr. Stroud ; John Theophilus, Esq.; J. Tudhope, Esq., M.L.A.; H. von Laer, Esq.; J. Walker, Esq , M.L.A.; A. Walsh, Esq.; E. H. Walton, Esq ; A. Wilmot, Esq.

EXECUTIVE COMMITTEE :

The Hon. H. W. Pearson, Chairman ; Messrs. J. Brister, E. Castens, W. Hume, C. T. Jones, W. Savage, John Tudhope, J. Walker, A. Wilmot, and R. Ryall.

WM. SAVAGE, HON. TREASURER.
FRED. LEVICK, SECRETARY.

APPENDIX II.

PROSPECTUS.

A Grand Industrial Exhibition of Arts, Manufactures and Products of India and the Colonies has been organized under highly influential auspices, and is to be held in London in the course of the year 1886.

An earnest desire has been expressed that the Colonies and States of South Africa should be adequately represented at that Exhibition.

To attain this object, as well as to afford the inhabitants of South Africa an opportunity of becoming more intimately acquainted with the natural resources and manufacturing capabilities of their country, it has been determined to hold an Exhibition in Port Elizabeth during the latter part of the year 1885, from which a selection will be made for transmission to the Exhibition in London.

The Promoters of the undertaking are deeply impressed with the importance of making every effort to show that the Inhabitants of South Africa have determined to take their stand as Producers and Manufacturers side by side with those of the other Countries represented in the Exhibition.

The Promoters especially invite assistance from the representatives of the Pastoral and Agricultural interests, these being of the greatest

importance to the prosperity of South Africa. At the same time they do not lose sight of the scarcely less important object of fostering and encouraging South African Manufactures. They believe this object can best be accomplished by exhibiting a representative collection of such commodities suitable to the wants of Colonial life as can be profitably manufactured in the country.

The bringing together of all classes, producers and manufacturers, distributors and consumers, must also tend to quicken and stimulate the Commercial and Agricultural life of the people.

The extensive natural resources of South Africa have been but imperfectly developed, and require to be better known even to the residents themselves. Among these resources are the various Woods, Grasses and Fibres; also Diamonds, Gold, Copper, Coal, Iron, and other Minerals, and it is hoped that large and general exhibits of these will be forthcoming. Geological, Zoological and Botanical specimens will likewise be gladly received for the purpose of lending additional interest to the Exhibition, while they will assist in directing the attention of scientific men to the ample field of research lying open to them.

The Fine Arts will not be neglected. Exhibits of Paintings, Sketches, Photographs, and objects illustrative of South African life and character, will be gladly received. Literary effort will also be encouraged by offering prizes for Essays or Papers on subjects bearing on South African pursuits and industries.

While the competitive principle cannot be fully carried out in this Exhibition, the Promoters consider it desirable that Exhibitors should be further encouraged by the awarding of a limited number of Gold, Silver, and Bronze Medals to such exhibits as may be deemed worthy of special commendation.

The co-operation of the sister Colony of Natal, the Orange Free State and the Transvaal Republic, is confidently looked for to make the undertaking completely successful

The Native Industrial Institutions will, it is hoped, embrace this opportunity of showing to the Colonial and the English Public the progress that is being made in agricultural and mechanical industries amongst the various native populations.

Government has assured the Promoters of liberal assistance, and promised to give special Railway facilities for the transport of Exhibits and Exhibitors. The conveyance of visitors will be arranged at greatly reduced rates.

Port Elizabeth possesses great advantages as the most suitable locality for the proposed Exhibition, because of its central position and facility of communication by land or sea. By the liberality of the Mayor and Town Council the magnificent New Market Buildings, affording ample and convenient space, have been placed at the disposal of the Promoters. A large representative and influential Committee has been appointed, and a Guarantee Fund, now amounting to £3,500, has been opened to cover any possible loss on the undertaking

The Promoters suggest that local Committees be at once formed in all the District Towns to correspond with the Central Executive Committee, and to co-operate with them in furthering the objects of the Exhibition.

APPENDIX III.

SYNOPSIS OF CLASSIFICATION.

GROUP A ... ... RAW MATERIAL.
GROUP B ... ... MANUFACTURES.
GROUP C ... ... NATURAL HISTORY AND SCIENCE.
GROUP D ... ... FINE ARTS.

GROUP A.—RAW MATERIALS.

Section I.—Vegetable Products.
Section II.—Animal Products.
Section III.—Minerals.

GROUP B.—MANUFACTURES.

Section I.—From Vegetable Substances.
" II.—From Animal Substances.
" III.—Articles of Food and Consumption.
" IV.—Articles of General Utility.
Section V.—Articles Manufactured from Wood.
" VI.—Metal Manufactures.
" VII.—Manufactures from Stone and Minerals
" VIII.—Fancy Goods.
" IX.—Jewellery.
" X.—Machinery.

GROUP C.—NATURAL HISTORY AND SCIENCE.

Section I.—Zoology.
" II.—Botany.
Section III.—Geology.
" IV.—Mineralogy.
Section V.—Conchology.
" VI.—Native Curiosities.

GROUP D.—FINE ARTS.

Section I.—Paintings, Drawings, Sketches and Photography.
" II.—Literature, Treatises and Essays, and other Literary Works regarding South Africa.

APPENDIX IV.

REGULATIONS FOR EXHIBITORS.

1. Applications for space, with full particulars of the Exhibit, must be made in writing to the Secretary before the 10th November, and upon forms to be had from him. All applications must be accompanied by a remittance for the charge for space required.

2. The charge for space inside the Building for floors will be 1s. per square foot up to 100 square feet; over 100 feet and not less than 125 square feet, £6; over 125 square feet and not less than 150 square feet, £7; over 150 and not less than 175 feet, £8; over 175 and not less than 200 feet, £9. For spaces of 200 feet and upwards a special rate will be quoted on application. Wall space, 6d. per square foot. Exhibits against the Wall exceeding 4 feet in height will be charged for the Wall space above that height in addition to their Floor space. No stand for Exhibits must exceed 10 feet in depth. The Committee reserve to themselves the right of free admission in special cases of Fine Arts, and also of charging extra prices for special stands.

3. Packages intended for the Exhibition must bear official labels, which will be furnished by the Secretary.

4. All arrangements for the display of Exhibits, including special constructions, stands, cases, tables, shelves, and the erection of all machinery and apparatus, must be carried out by Exhibitors at their own cost, and in accordance with plans officially approved. Tables will, however, be provided for Exhibits requiring a space not exceeding 6 square feet. All signboards or descriptive notices will be subject to approval of Committee.

5. The Committee have appointed Messrs. RODWELL, EDWARDS & Co. to act as Agents for clearing at the Customs, transporting, receiving, unpacking and arranging of Exhibits as per their tariff, which has been approved by the Committee; but Exhibitors may appoint their own Agents if they so desire.

6. Exhibits will be received on the 1st December and following days up to the 5th December. Any goods received after that day will be subjected to a fine of 25 per cent. of the charge for space.

7. Arrangements have been made with the Railway Department to carry all goods intended for exhibition to and from Port Elizabeth free of charge, provided they remain the property of the Exhibitor. If, however, any exhibit brought by rail is sold, the Exhibitor will have to pay the ordinary railway rates. The Committee hope to make favourable arrangements for the carriage of goods intended for exhibition with the Steamship Companies, particulars of which will be given later on.

8. Articles may be sold whilst the Exhibition is open, and delivered from stock; but the samples and goods entered for Exhibition cannot be removed until the Exhibition is closed.

9. The utmost precaution will be taken to preserve Exhibits from injury. No responsibility will be taken by the Committee for damage or loss, whether arising from fire, accident, or depredation, either in the Building or while being conveyed to or from the same. Exhibitors can make their own arrangements for effecting insurances. Safes will be provided for precious stones, gold, &c.

10. No Exhibits of a dangerous or offensive nature, or likely to cause injury to the Building or its contents, can be accepted.

11. No sketch, copy, or reproduction of any Exhibit may be taken without the special permission of the Exhibitor and Committee.

12. Special regulations relating to machinery in motion may be obtained from the Secretary. The space for the exhibit of large classes of machinery being limited, parties desirous of exhibiting such will be accommodated if circumstances allow.

13. An entrance card (not transferable) will be delivered to each Exhibitor or his Agent gratis. Exhibitors must acquaint the Secretary with the number of their employés, each of whom will be provided with a number badge bearing the name of the Exhibitor, who will be held responsible for their good behaviour.

14. Every Exhibitor, upon making entry, thereby acknowledges and undertakes to observe the rules and regulations established for the government of the Exhibition, and will be liable to expulsion from the Building in case of non-compliance with the same.

15. An Official Catalogue will be published.

16. Exhibits must be removed immediately after the close of the Exhibition, otherwise they will be removed and stored at the expense of the Exhibitor.

17. The Committee reserve to themselves the right to alter or amend any of these Regulations from time to time as they may think fit.

APPENDIX V.

(a.) LIST OF LONDON GUARANTORS OF THE SOUTH AFRICAN EXHIBITION.

Balme, C., & Co.
Barlow & Jones.
Buchanan Bros., J.
Campbell, W. W., & Co.
Cayzer, Irvine & Co.
Cook, Son & Co.
Cook, Son & Wormald.
Cooper, Thomas.
Copestake, Hughes & Co.
Corsar Bros.
Dyster, Nalder & Co.
Fraser, W.
Fry & Son, J. S.
Gossage & Son.
Hale & Son.
Harmer, F. W., & Co.
Hennessey, J., & Co.
Hill, Sydney.
Huntley & Palmer.
Johnson, G.
Jones Bros. & Co.
Keen, Robinson & Co.
Keiller & Sons, J.
McIntyre, Hogg & Co.
Middlemore, W.
Morley, J. & R.
Oppenheimer, D., & Co.
Parnall, R. & H.
Pawson & Co.
Rodgers, J., & Sons.
Reynolds, Chas., & Co.
Sharp, Perrin & Co.
Spreckley, White & Lewis.
Thomas, Sons, T. J., & Co.
Tolhurst & Sons.
Townsend, T., & Co.
Turner Bros., Hyde & Co.
Union Steamship Co.

(b.) LIST OF LOCAL GUARANTORS AND DONORS TO THE EXHIBITION.

Anderson, W., & Co.
Arnholz, B., & Co.
Birch, T., & Co.
Bissecker, George, & Co.
Brandt & Lehmann (Limited).
Brister, J., & Co.
Bruce & Gardner.
Castens, Emil.
Castle Mail Packets Co., The
Cleghorn & Harris.
Deare & Co.
Dickson, A., & Co.
Dreyfus & Co.
Ebell & Co.
Fachse, Eaton & Koster.
Fischer, A., & Co.
Fordred, J., & Co.
Gordon, J, & G.
Griffiths & Co.
Guardian Assurance and Trust Company.
Hannam, Archibald & Co.

Hansen & Schrader.
Hirsch, Loubser & Co.
Holland & Vardy.
Holland, J. A.
Howard, Farrar & Co.
Jeffrey & Co.
Joseph, J., & Sons.
Kemsley, J. C.
Kettle, George.
Lennon, B. G., & Co.
Lippert, E., & Co.
Mackay, J., & Sons.
Mackie, Dunn & Co.
McGill, B. D.
Mosenthal, A., & Co.
Philip, Tudhope & Co.
Poppe, Schunhoff & Guttery.
Port Elizabeth Assurance Co.
Provident Assurance Co.
Ryall, R.
Savage & Hill.
Savage, Wm.
Union Steamship Co.
Von Ronn, Schabbel & Co.
Wilmot, Alexander.

DONORS.

Bank of Africa, The (Limited).
Port Elizabeth Gas Co., The.
Port Elizabeth Tramway Co., The.
Port Elizabeth Steam Mill Co., The.
Standard Bank, The (Limited).
Union Boating Co., The.

APPENDIX VI.

LECTURES AND ESSAYS INCLUDED IN THIS VOLUME.

No.	Subject of Paper.	Author's Name, &c.	Remarks.
I.	On the South African Exhibition: Analytical and Descriptive Essay	Walter Bruce, Port Elizabeth.	The Prize Essay, awarded the Gold Medal and £10.
II.	On the Fine Arts ...	A. de Smidt, Sur.-General, Cape Tn	A Lecture.
III.	On the Importance of Instruction in Drawing, Modelling and Designing, in the Practical bearing of these subjects on Trade and Manufacture.	R. H. Hammersley-Heenan, M.I.C.E. Cape Govt. Railways, Port Elizabeth.	The Prize Essay, awarded the Silver Medal.
IV.	On the Establishment of Agricultural Schools at the Cape.	A. Fischer, Professor of Agriculture, Stellenbosch College.	A Lecture.
V.	On the Principles of Agricultural Science: as a Subject to be taught in the ordinary School Course.	J. W. Stroud, M.D., Port Elizabeth.	Prize Essay, awarded the Gold Medal.

No.	Subject of Paper.	Author's Name, &c.	Remarks.
VI.	On Agricultural Science and its application to the condition of the Colony.	J. W. Stroud, M.D., Port Elizabeth.	Prize Essay, awarded the Gold Medal.
VII.	On Forestry in India, the Colonies, and the Cape Colony.	D. E. Hutchins, Conservator of Forests, King Wm's Town.	A Lecture.
VIII.	On the Fruits and Fruit Trees of the Colony.	Henry Golding, East London	A Lecture.
IX.	On Viticulture	Baron von Babo, Viticulturist to the Government, Cape Town.	A Lecture.
X.	On Water Finding, Dam-making, River Utilization, Irrigation.	Thomas Bain, C.E., Public Works Department, Cape Town.	A Lecture.
XI.	On Weir System of Irrigation, with special regard to the Rivers of the Colony.	Patrick Fletcher, Public Works Department, Port Elizabeth.	A Memorandum.
XII.	On Underground Water Supply, with special reference to the Colony.	Thomas Stewart, Assoc. M.I.C.E., F.G.S., Hydraulic Engineer's Dept., Cape Town.	A Lecture.
XIII.	On Diamonds and the Diamond Fields.	P. M. Laurence, LL.D., one of the Judges of the Supreme Court, Kimberley.	A Lecture.
XIV.	On Stock Breeding ...	J. B. Hellier, Queen's Town.	A Lecture.
XV.	On Diseases of the Liver in some of the Domestic Animals of the Colony.	D. Hutcheon, Col. Vet. Surgeon, Pt. Elizabeth.	A Lecture.
XVI.	On Scab in Sheep: Its Prevention and Cure, and the benefit to be derived from the passing of a Compulsory Scab Act.	J. W. George, Graham's Town.	A Prize Essay included in this volume (by permission) to supply the place of a Lecture by Dr. Berry, of which no transcript was made.
XVII.	On Sheep Farming and the Growth and Preparation of Wool for Export.	Arthur Francis, Glen Cairn, Cathcart.	The Prize Essay, awarded £10.
XVIII.	On Angora Goat Farming and the Growth and Preparation of Angora Hair for Export.	Charles Lee, sen, Korsten, Pt. Elizabeth.	The Prize Essay, awarded £10.
XIX.	On Horse Breeding ...	W. Grey Rattray, Port Elizabeth.	An Essay written subsequently, at the request of the Committee.

APPENDIX VII.

[A.]

JURORS' REPORTS.

In the following arrangement the Classification under each Section precedes the Reports and the Awards by the Jurors.

GROUP A.—RAW MATERIALS.

SECTION I.—VEGETABLE PRODUCTIONS.

CLASS 1.—Specimens of Colonial Woods in rough, and polished to show grain.

" 2.—Specimens of Natural Grasses and Fibres capable of being manufactured into rope or paper, with botanical names and descriptions, also locality where found. Specimens of the finished product.

" 3.—Specimens of Plants producing gum, berry wax, aloes, and chemical substances. For example, Buchu, Ganna Bark, with the like information, and specimens of the extracted products.

" 4.—Specimens of indigenous Medicinal Plants, dried, showing locality and growth, with labels attached stating briefly their peculiar properties, &c., *e.g.*, Euphorbium, Buchu, Male Fern, Native and Bush Teas, Castor Oil Plant, &c.

" 5.—Specimens of Exotic Plants, capable of successful culture in the Colony, with specimens of finished products, such as

(*a*.) Bread and Food Plants, *e.g.*, wheat, mealies (maize), Kafir corn (millet), sorghum, arrowroot, sago, &c.

(*b*.) Articles of Consumption,—sugar cane, coffee (raw), India and China tea, tobacco in leaf.

(*c*.) Articles of Manufacture,—cotton, flax, agave, palmiet, &c.

CLASS 6.—Fruits indigenous and cultivated, dried, or otherwise preserved.

" 7.—Collections of Seeds, Bulbs and Flowers, such as Everlastings, &c.

CLASS 1.

REPORT ON SPECIMENS OF COLONIAL WOODS IN ROUGH AND POLISHED TO SHOW GRAIN.

Jury.

MESSRS. B. SUTCLIFF, JOSEPH SWALLOW, C. SODERBERG.

We beg to report that we have inspected a large collection of samples in blocks and panels from the Crown Forests of the Knysna and the Eastern Districts. The woods shown are suitable for marine and trade purposes; several specimens, however, appear to have been cut out of season, and do not present the most favourable appearance, but there are some fine specimens of Yellowwood, Stinkwood, Pine and Camphor Wood. The extended cultivation of the last two named is specially recommended. Attention is also called to the Cape Box, the specimens exhibited showing valuable qualities, and to Yellowwood, well adapted for ebonizing and staining. A specimen marked "Wag wood" is noticeable as specially suitable for general cabinet work. The specimens of wagon wood are also of excellent quality. The assortment of woods from the Government Forests of Victoria (Australia) is very varied, and consists of well got-up specimens, but rather too small in size to give an adequate idea of their suitableness for various purposes.

We observe that the specific gravity of the Australian woods is much less than that of similar descriptions in this Colony. In the Natal Court we notice a pane of hard wood unnamed, which appears of good quality. Mr. W. B. Maphan, Cowie, Bedford, shows a collection of small specimens of various woods, cut in the forest on his farm, "Glen Gregor." The quality is good, but the samples are apparently all cut from small trees, and are no guide as to the productive capacity of the forest.

The exhibit of Messrs. W. Williams & Co., from the Maastrom forests, Bedford, consists of carefully got up samples, twenty-five in number, varied in description, and generally of good quality, and is, we consider, entitled to an award of a silver medal.

CLASS 2.

REPORT ON SPECIMENS OF NATURAL GRASSES AND FIBRES, CAPABLE OF BEING MANUFACTURED INTO ROPE OR PAPER, &c.

Jury.

MESSRS. JAMES W. STROUD, M.D., GEO. W. SMITH, C.E., PETER FRANCE

Owing to the still tentative condition of the hopeful fibre industry, which has taken root near Maritzburg, Graham's Town and Uitenhage, the judges would observe that their survey was chiefly directed to excellent specimens of prepared fibres and various kinds of cordage made from "fourcroya" and "sansaveria," plants abundant in Natal and Albany, but needing mechanism and cheap labour to enable producers to compete with Mauritius and India, which now export these to London in the fibre stage, along with jute and hemp. Samples of

an apparently aquatic grass, both in the raw and manipulated state, are shown from Maclear by Mr. W. J. Symes and Mr. A. G. Austen, but the plants are not particularized, nor is the price of the dark cordage quoted. Bleaching has not been attempted probably from fear of weakening the fibre, which may resemble the sisal grass of Honduras, now a great article of export to New York and London for making cheap paper and bagging. To encourage these gentlemen in prosecution of their enterprises, we award the exhibits honourable mention, but they afford no data as to quantity or quality of the fibres, which are from 24 to 30 inches long. The Natal exhibit of Mr. J. R. Blamey, Maritzburg, shows large masses of clean, lustrous, white fourcroya fibre, eight feet long and tenacious, the cordage resembling ordinary manilla, and being entirely hand made. No breaking strains are given, but the article is assuming a commercial aspect in the sister colony, and it would have been advisible if the percentage of the leaf available for sale had been stated, and the cost at which it can be sold in Natal We recommend a silver medal.

Mr. R. Tillard, of Graham's Town, presents good results of expensive and arduous labours to utilize the "sansaveria," common in the Kowie and Fish River districts, where he will essay treatment by small portable machines, to be worked by hand, as the material cannot bear the cost of transport. The fibre is inferior in length, strength and aspect to the fourcroya, but the ropes appear very suitable for many purposes where cheap lashings will serve. As with other exhibits, no details are afforded of cost as compared with imported cordage, but with all these nascent industries allowances must be made for many initial difficulties of production by hand. The material should be suited for nettings to protect fruit and horses, for wheat binding and for fishing, like the "Phormia tenax" fibre of New Zealand. We advise the award of a silver medal.

To five presumed varieties of fibre produced by Mr. Roth, of Uitenhage, we have given close attention, as they have been appraised in London by experts, and show there is a wide field for the operations of the Company now starting under the management of Mr. Roth, who was Botanical Director to the late Khedive. For a decade he has made experiments with African fibres for mercantile purposes. He also shows a lustrous wild cotton like that found in Ecuador. Mr. Roth having devoted great practical knowledge and much time and capital, in order to enable our raw materials to take a commercial form, we cordially advise that a bronze medal be conceded for his valuable efforts.

CLASSES 3 & 4.

REPORT ON SPECIMENS OF PLANTS PRODUCING GUM, BERRY WAX, ALOES, AND CHEMICAL SUBSTANCES; ALSO ON INDIGENOUS MEDICINAL PLANTS, &c.

Jury.

MESSRS. JAMES W. STROUD, M.D., F. E. CONSTANCE, J. L. REELER.

We do not find any competition in Cape Aloes, but from Messrs. Fleming and Mudie very superior and unusually bright samples were sent. We think them worthy of a bronze medal.

In going over the various exhibits of Berry Wax we cannot pass over the very pretty sample of pure Wax shown by Mr. Spindler. Although only a very small quantity on top of a bottle, still it proves

what can be done in regard to elegance and purity of this useful article. The fine berries inside the bottle show luxuriant growth, and we therefore award a bronze medal.

Mr. Sims shows very fair samples together with the berry plant in its natural form, and a few Berry Wax candles, but we do not consider the wax so good as that shown by Mr. George Brown, which appears to be free from impurities but not quite so light in colour as that shown by Mr. Spindler, but when we consider the large amount used by this exhibitor in the manufacture of candles, and which certainly look very nice and superior in quality to any other Berry Wax candles exhibited, we award him a bronze medal for producing results.

Mr. Parent shows a fair sample of Wax. Also Mr. Chas. Barber, together with a few candles of inferior quality.

The next article in this class, Buchu Leaves, a good sample, is shown by Mr. Leinberger of the longifolia or long leaf buchu, but the best buchu is shown by Mr. Parent, it being of greater commercial value, and we therefore award him a bronze medal.

Referring again to this exhibitor, we find a great want of classification and general knowledge of the different indigenous medicinal plants, roots, &c., exhibited by him. Had he arranged them with the same care as Mr. Smith, of Lovedale, and knew their natural order, we should have been able to say more about these exhibits, but they are so jumbled together that we do not feel justified in making any further remarks about him. The Lovedale exhibits are very carefully and tastefully arranged, and great praise is due to Mr. Smith, of that Institution, in giving us a full and complete history of the various plants and roots used so largely among the natives. The Wild Hemp, or Dagga, is most important, it being universally acknowledged by natives to be the great antidote for snake bites, and therefore a great blessing to mankind. There are many other specimens of poisonous herbs used by them to poison their arrows, also many well-known remedies for various diseases, some of which could be added to our Materia Medica to great advantage. This gentleman's collection is to our judgment worthy of a silver medal if the Committee can arrange to meet the case.

Mr. Jesse Shaw has a very neatly arranged case containing his well-known specifics.

In the Natal Court we notice a Liniment and Herbal Ointment, but not knowing the composition of these articles, are unable to judge of their merits.

N B —In Class 3 our attention is called to Gums, and regret to say we have not seen a single sample, especially Gum Acacia, a most important and largely used article. Ganna Bark we do not know nor have we seen any.

In Class 4 we have not seen Male Fern, Native and Bush Teas, nor Castor Oil plants

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CLASS 5 (*a*).

REPORT ON SPECIMENS OF CEREALS, &c.

Jury.

MESSRS. F. RUDIN, W. BURLS, H. B. CHRISTIAN.

We, the undersigned judges on Section I, Class 5, say wheat, maize, &c., have to report that the exhibition of cereals was limited, owing to

the fact that harvesting generally was scarcely in operation, and not concluded at the opening of the Exhibition. We award the prizes as follows :—

Wheat.—Gold medal to R. Oosthuizen, of Poortjie, Colesberg division, for a very superior sample of soft white wheat.

Gold medal to Rassau Bros. Kalabaskraal, Malmesbury, for the best sample of Du Toit's wheat and the exhibits of grain, generally, Du Toit's wheat being a very useful floury wheat.

Silver medal to C. J. Watermeyer, Graaff-Reinet, for a superior well-grown sample of golden-ball wheat.

Silver medal to P. Ryan, Malmesbury, for an excellent sample of wheat ; name unknown.

Barley.—Silver medal to P. and P. Rabie, Worcester, for a very superior sample.

Pearl Barley.—Silver medal to J. J. Joubert, Worcester, for an excellent sample of pearl barley, made from Colonial grown barley, equal to, if not better made, than any that can be imported.

Maize —Silver medal to C. Brown, King William's Town, for a very fine sample of yellow maize.

Oats, Rye and Peas.—There were exhibits of oats, rye and peas which we class as follows :—

Oats : P. Ryan commended.
Rye : J. J. Joubert do.
Peas : J. J. Joubert do.

Oat Sheaves.—Those exhibited by W. Dyer, King William's Town, and R. Oosthuizen, Colesberg, are highly commended.

We cannot but regret that, with some exceptions, the exhibitors of wheat failed to name or describe their exhibits ; and as wheat grown on different soils has a distinct appearance, it would have been useful to judge the effect of soil on the growth, and much interest would have attached if the yield per acre or return per bushel had been given. As the more extended cultivation of wheat is a matter of the greatest consequence to the Colony, such information would have been most valuable.

CLASS 5 (*b*).

REPORT ON ARTICLES OF CONSUMPTION—SUGAR CANE COFFEE, TEA.

Jury.

MESSRS. W. T. KINGSMILL, R. HALLACK, W. G. TOWNSEND.

Natal Court.

Sugar.—The Victoria Planters' Association exhibit a large variety of various qualities of sugar. None of the white crystallized samples are worthy of special commendation. The best sample was marked "L.M" 1. Silver medal.

Yellows, a very superior sample marked "Esperanza Y," which we think worthy of a silver medal.

Teas.—The last exhibit of teas was exceedingly satisfactory. The quality of some of the samples [illegible] the [illegible] have been [illegible] in [illegible] from [illegible] and India. [illegible] is to be [illegible] in [illegible] the new industry in Natal and the [illegible] at present the [illegible] of [illegible] in Natal would [illegible] here [illegible] for our market. We recommend the special [illegible] to Mr. [illegible]'s samples grown from Assam and China seed as well suited for our trade.

Two samples of [illegible] marked "Golden Pekoe" very fine [illegible] and [illegible] supplied by Messrs. Blaine & Co., with other samples, were carefully tested. We consider them worthy of a silver medal.

Coffee. The exhibit of coffee was a very small one. One bag only, from Messrs. [illegible], grown in the Kat Valley Estate. [illegible] of very superior quality and well worthy of special commendation. Coffee of this quality would be very saleable here, but judging from the slow progress coffee growing has made in Natal (now thirty years since its commencement), we cannot look forward to any future supplies from thence as we may reasonably do from the new tea industry.

CLASS 7.

REPORT ON COLLECTIONS OF SEEDS, BULBS & FLOWERS.

Jury.

MESSRS. CHAS. R. DEARE, CHARLES COX AND LAWRENCE JONES.

For the best collection of Seeds, we recommend a gold medal to Messrs. Smith Bros., who are to be commended for the spirit of enterprise shown by them, and for the excellent order and classification of the various descriptions of seed exhibited.

For the best collection of Bulbs and Everlastings, we recommend a gold medal to Mr. Robert Templeman, of Cape Town.

Mr. [illegible] Parent, of Cape Town, has a valuable collection of Bulbs and Medicinal Herbs, but they are badly arranged and indistinctly named, which is to be regretted; we, however, recommend a bronze medal.

To Messrs. Carter Bros. we recommend a silver medal for their collection of Agricultural and other Seeds, and a bronze medal to Messrs. Ryland and McMaster, whose exhibit is very good, their wheat varieties exceeding those of any other exhibitor.

SECTION II.—ANIMAL PRODUCTS.

CLASS 8. WOOL. Specimens of all descriptions of Wool grown in South Africa, in every stage of progress.

(a.) Grease. Fine Merino Wool, from sheep bred in the country, classified as to the fineness and length of staple, locality where grown: mountain, karoo, or grasslands. Values in London of each description.

(*b.*) Grease, Fine Merino Wool, from imported sheep of various breeds, showing the gradation of quality and length of staple of Australian, English or Continental sheep, for comparison.

(*c.*) Grease, similarly classified, of Second Qualities, and Coarse Wool.

(*d.*) Any fancy breeds of Wool suggested as useful to be introduced, with information respecting them.

(*e*) Specimens of the Native Sheep Hair. Photographs of the various kinds of sheep producing the Wool would be most useful to accompany the specimens—showing those best adapted for the country, for wool growing.

(*f.*) Fleecewashed Wool of similar descriptions and similarly classified.

(*g.*) Scoured (Snowwhite) Wool of various descriptions. Details of the establishment where scoured, description of wool, where grown, &c., should accompany these exhibits.

N B.—The exhibits of wool should be prepared so as to show at a glance the information required, and a quantity of not less than 100 lbs., nor more than 150 lbs. of each description should be sent. The market value in London should also be stated.

CLASS. 9.—ANGORA HAIR.—Specimens of thorough-bred and half-bred, and original goathair, showing the progress and improvement of the article. For the purpose of comparison, specimens of Turkey Mohair should accompany specimens of Cape Mohair, and market values in London be attached. Photographs (if possible) of animals producing Hair, description of locality, name of owner, whether imported or colonial, should be stated, and quantities of not less than two fleeces of each quality shown.

„ 10.—SILK.—Showing the various conditions of production and growth from Silkworm: The Cocoon, and the Silk as prepared for manufacture, accompanied, where possible, by a card showing market value, and any information as to locality in which it is grown, and the quantity raised.

„ 11.—HIDES, SKINS AND HORNS of all animals, domesticated and wild, in their salted, dressed, or preserved condition. Ox, Goat, Wildebeeste, Bucks, &c.

„ 12.—FEATHERS.—Ostrich and Wild Bird Plumage, undressed. In quantities of 8 oz. of each description, to be carefully sorted and exhibited in bunches showing each quality separately.

CLASS 8.

REPORT ON ALL DESCRIPTIONS OF WOOL GROWN IN SOUTH AFRICA, IN EVERY STAGE OF PROGRESS.

Jury.

MESSRS. JOHN HALL, T. E. THEWLIS, H. DEDICKE, O. KIEFSIG, J. GORTON.

GREASE WOOL.

No. 24—*A. W. Hart, Cathcart.*—This wool we consider the best sample exhibited, being of superior quality, long, sound staple, splendidly

got up, and in every way suitable for combing purposes. We strongly recommend flockmasters to endeavour to breed up to this sample. This exhibit is worthy of all praise, and we suggest a gold medal should be awarded.

MOUNTAIN AND GRASS VELDT WOOL.

No. 17—*Geo. King and Son (Bedford).*—Long, fine, well-bred wools, strong in staple, very well got up, and no faults. The grass veldt wool we find a little longer in staple than that grown on mountain. We recommend a gold medal.

No. 48—*John Kemp (Cathcart).*—A very well deep grown wool, of good quality, no faults. Also recommend a gold medal.

Mr. D. P. Pienaar (Molteno).—A very good, light, deep and evenly grown wool of superior quality. Recommend a silver medal.

No. 2—*R. Rubidge (Graaff-Reinet).*—A fine Karoo Wool, well grown, and well got up, fair length of staple and good breed. Recommend a silver medal.

No. 25—*A. Vigne & Co. (Middelburg).*—Wool of very fine quality, little irregular in length of staple. Australian character. Recommend a silver medal.

No. 7—*G. B. Murray (Klipkop, district of Colesberg).*—Very good, sound, well-bred wool, well got up and evenly grown, but should be finer in quality. The clip, however, may be considered very desirable for combing purposes, and is altogether very creditable to the district. Hon. mention.

No. 10—*J. J. Edwards (Seacow Kloof, Bedford).*—Lambs' wool of Australian character, very well bred and regular in length of staple. Ewes, good quality, but a slight falling off is perceptible. Hon. mention.

No. 16—*F. F. Wienand (Bedford).*—Well-grown wool, regular in length and of medium quality, partly tender in staple. Hon. mention.

J. A. Vermaak (Zuurfontein, Burghersdorp).—Eight months' wool, of very good breed and fine quality, good length, but would be much improved if allowed to grow 12 months. Hon. mention.

H. Brown (Cathcart).—A useful combing wool, being well grown and sound, of medium quality. Hon. mention.

P. C. Rorich (Molteno).—A good, well-grown wool, sound in staple, fair length, rather wanting in quality. Highly commended.

C. F. Hattingh (Molteno).—Also good, well-grown wool, fairly sound and medium quality, not quite so regular as former lot. Hon. mention.

No. 3—*P. J. Joubert (district Colesberg).*—Fairly bred, but irregular in quality and length, not skirted, badly got up.

No. 4—*P. P. C. von Maltitz ("Niekerk's Font," Colesberg).*—Poor breeds, mushy and tender, fairly well grown, but wanting in quality, and burry.

No. 6—*J. J. Murray (Groot Haff Akker, district of Colesberg).*—Fairly got up, but, like previous clip, wanting in quality, mushy, tender and burry, although some fleeces are good and sound. This clip might be much improved by the introduction of fresh blood.

No. 13—*T. W. King (Bedford).*—Sound, deep grown, but irregular and running off in quality.

No. 14—*F. H. King (Bedford).*—Appears to be of same breed as No. 17 (G. King & Son), but is not so long in staple, although fine in quality. This lot is badly shorn, and not properly skirted.

No. 15—*J. Edwards* (*Bedford*).—Deep, well-grown wool, but very poor in quality and brandziekte.

No. 19—*J. S. Moorcroft* (*Klipkraal, district of Wodehouse*).—Irregular in length and quality, somewhat mushy, earthy and tender, unsuitable for combing purposes.

No. 20—*S. Moorcroft* (*Klipkraal, Wodehouse*).—Similar to the above.

J. A. van Niekerk (*Victoria West*).—Fair quality, but rather tender and faulty.

No. 28—*A. H. Murray & Co.* (*Boschfontein, Hanover.*)—Fine quality, medium length, but very tender.

No. 30—*G. M. N. Booysen* (*Patrysfontein, district of Richmond.*)—Rambouillet—Poor breed, short, mushy, tender, and devoid of character. Australian—More regular, and better in every respect than the Rambouillet exhibit.

F. J. van Zyl (*Buffel's Vlei, district Colesberg*).—Wanting in quality, tender and mushy.

C. J. Watermeyer (*Graaff-Reinet*).—Good breed and fair quality, but unevenly grown and badly got up.

MOLTENO EXHIBIT.

We consider the samples shown, as representing clips to the extent of 1,500 bales, to be very creditable to the district, and we are of opinion that, with a little care and judicious breeding, the clips may be improved, so as to compare favourably with the same quantity grown in any other part of the Colony.

N—D. P. Pienaar.—Silver medal awarded, being the best sample shown.

D. C. Ronch.—Highly commended.

C—F. Hattingh.—Honourable mention.

G—Piet Cloete.—Fair length and quality, but somewhat tender and mushy.

D—C. J. Vice *L—J. Lagrange* *K—Jan van Straeten* *R—And. Eslarke* *S—Piet Hattingh* *M—P. J. Hattingh*	These samples being about equal, we class together. They are fairly grown, but irregular in length of staple, and partly tender, and might be improved in quality. Good useful wools for clothing, but not suitable for combing.
A—J. van Straeten *B—C. Hattingh* *F—P. V. L. van Zyl* *H—C. T. Hattingh* *I—Jacob van Zyl* *O—J. N. Roberts* *P—Jan Hemmings* *Q—J. Coetzee* *T—C. J. Hattingh*	Also of one description, being rather short, tender in staple, and somewhat mushy. Commonly known as washing wool.

FLEECE-WASHED.

ONLY TWO SAMPLES SHOWN.

No. 17—*Geo. King & Son.*—10½ and 14 months' growth, very fine extra quality merino wool, well washed and got up. The class of wool which should be produced in this Colony, and which is in active demand in the Home markets. Recommend gold medal.

No. 21—*S. Moorcroft.*—Good length of staple, fine well-bred wool, but not so well washed and got up as previous lot. Recommend silver medal.

SCOURED (SNOW-WHITE).

Uitenhage Washed Wools.—On the whole, are very well washed and got up, and show some improvement, especially in the manipulation of fine wools. The order in which we place the different samples is as follows:—

1st No. 8		
2nd " 10	Gubb.	Awarded gold medal.
3rd " 7		

4th No. 1—*Robertshaw.*—Awarded silver medal.
5th No. 9—*Springfield.*—Honourable mention.
Standard, Middelburg, Sylvia and Burghersdorp.—Samples from these establishments were exhibited, which are a great improvement on usual country scouring, but would show a much better result if washed more open and flaky.

CLASS 9.

REPORT ON ANGORA HAIR.

Jury.

MESSRS. ADAM ACKROYD, CHARLES LEE, J. W. FOX.

The quantity in this class is very small. There are in all only nine exhibits: from the district of Bedford 3, Adelaide 1, Graaff-Reinet 2, Jansenville 2, and Colesberg 1; and among these, excepting that of F. Holland, we find none from the well-known breeders and largest producers.

This is no doubt, to some extent, owing to the Exhibition being held four months after shearing time, which necessitates keeping the hair on hand. Had the breeders known that the small quantity of two fleeces would have been sufficient to form an exhibit, the number of exhibitors would no doubt have been much greater.

Although the quantity of hair is comparatively small, and we feel somewhat disappointed in not finding some of the well-known brands, still we feel satisfied that some of the exhibits are equal in quality to any that the Colony can produce. We find some of the fleeces perfectly free from kemp, of a full length staple, and brilliant lustre, and possessing that beautiful soft mellowness to the touch which is a sure indication of pure breed, and of a class which commands the highest market prices.

We would recommend breeders to take note of the difference between the sharp, harsh and coarse hair, and that we have just described.

While a large proportion of the exhibits show a class of breed which leaves room for considerable improvement (in breed), the number of complete fleeces that we find, as well as the careful manner in which

they are packed and placed for exhibition, go far to show a spirit of enterprise, which, if followed up, will in a few years show important and profitable results.

The opportunity, which is now given to those farmers who visit the Exhibition, of comparing the different classes of mohair, as well as the important lesson they will learn upon seeing the classes to which the different prizes have been allotted, will supply them with important information which they could not have obtained in any other way, and which, if turned to account, will result in the improvement of the breed of their flocks.

1. *Exhibitors : Theophilus Brothers (district of Jansenville).*—We find this lot of about thirty fleeces full grown, fine in quality, of a saleable class and free of kemp, but rather wanting in lustre ; and consider it entitled to the gold medal.
2. *Walter Edwards (district of Graaff-Reinet).*—Fifty lbs. of hair, principally kids, of good quality—fine, long and silky, free from kemp ; but we are of opinion that it does not consist of complete fleeces, and is therefore disqualified.
3. *Joseph Edwards (district of Bedford).*—Seven fleeces, full grown, most of it from grown goats, of good saleable quality and good breed, full length, fine and good lustre. Merits the gold medal.
4. *J. G. D. Rex (district of Jansenville).*—Eight fleeces, consisting of rams, ewes and kids, thorough and cross-bred. Those of the imported thorough-bred rams are impregnated with kemp, very harsh and sharp to the touch, and of a deep yellow colour. The Colonial thorough-breds have the same fault, though not to the same extent. The cross-breds are softer to the touch, but show a want of lustre, length and breed.
5. *A. F. Strauss (district of Colesberg).*—Four kids' fleeces, three of which, marked as A B C, are of fair breed, good length, lustre, and general quality. These we consider are entitled to the silver medal.
   The same exhibitor shows about forty fleeces of full grown hair, but very uneven in quality, sharp and harsh to the touch.
6. *G. Pretorius (district of Bedford).*—Two rams' fleeces, the one very light and fluffy, the other of very good quality in every respect, and entitled to the silver medal.
7. *F. Holland (district of Adelaide).*—One ewe's fleece of good quality in every respect, also a lot consisting of samples from seven bales of equally good quality. Not answering to the description in catalogue, we make no further remark upon it.
   [The following memorandum has been added to Mr. F. Holland's card : "Had the conditions been complied with, Mr. F. Holland's exhibit would have been entitled to a gold medal."]
8. *F. Wienand.*—A lot of about 40 lbs weight, all apparently cut from the neck of the goat ; so cannot be accepted as a legitimate exhibit for a prize.
9. *John Priest (Graaff-Reinet).*—A lot of about 60 lbs. weight, irregular in quality, long in staple, showing a good deal of kemp, bright lustre ; entitled to silver medal.

Remarks.—Had we gone through these exhibits before the opening of the Exhibition, we should have been able to come to more satisfactory conclusions, and with less trouble, as some of the whole fleeces were a good deal mixed, and the tickets which had been attached to others were misplaced. We have, however, done our best to rectify this, and consider that it will make no material difference to any of the exhibitors.

CLASS 10.

REPORT ON SILK IN THE RAW STATE.

Jury.

MESSRS. CHARLES RUSSELL DEARE, CHARLES COX.

There are no less than six exhibitors of Silk, but only two conform to the conditions contained in the Prospectus; of these, the samples of Mr. Valentine Roberts, of Uitenhage, are declared of the most superior quality. We therefore recommend him the gold medal.

The next in order of merit is in the Natal Court, for which we recommend a silver medal.

To encourage the cultivation of this product, we recommend the bronze medal to each of the other exhibitors, viz.:—L. B. Chesterton, Geo. Kerr & Son, J. J. Edwards and A. E. Thomas.

CLASS 12.

REPORT ON OSTRICH AND WILD BIRD FEATHERS.

Jury.

MESSRS. G. J. NATHAN, DAN. ANDRADE, A. G. WILSON.

We were disappointed at the few exhibitors, but were well pleased with the quality of the exhibits. The gold medal we have awarded to Messrs. P. and P. Rabie for the best assortment, but would strongly advise these gentlemen in future not to wash their feathers.

A silver medal awarded to Mr. Priest. A very well grown parcel, not sufficient proportion of femina, which were poor.

Prime Whites.—The gold medal was awarded to Mr. Holmes.

Long Blacks—A silver medal to Mr. Pringle

Long Drabs—A silver medal to Mr. Featherstone.

Femina—White Tails. The best parcel of these were in Messrs. P. and P. Rabie's exhibit, but we are of opinion that the gold medal should be sufficient for the reward of merit.

We are of opinion that the exhibits of Messrs. Featherstone and Pringle are worthy of honourable mention.

We would also draw special attention to the splendid exhibit of Mr. L. A. Benjamin, and, although not a grower, we consider him entitled to honourable mention, or, if the Committee feel disposed, fully worthy of a silver medal.

SECTION III.—MINERAL PRODUCTS.

CLASS 13.—Collections and specimens of useful and ornamental building stone, such as granite, marble, freestone, and other useful kinds. Clay for terra cot'a, brick and pottery work.

CLASS 14.—Ores and minerals in their natural condition, such as gold quartz, iron, coal, cobalt, lead, manganese, plumbago, quicksilver, asbestos, krokidolite, silver and copper ore.

„ 15.—Precious stones, diamonds in rough and matrix, garnets, carnelians, rubies, and other stones for jewellers' purposes.

„ 16.—Specimens of salt from pans or rock-salt in rough, limestone and its combinations. Ochres and earth suitable for cements, paints, &c.

CLASS 14.

REPORT ON ORES AND MINERALS IN THEIR NATURAL CONDITION.

Jury.

MESSRS. ROBERT PINCHIN, F.G.S., WILLIAM MAGEE GRIER, M.I.C.E.

B. G. Lennon & Co. exhibit 4 cases of ores and minerals, duly classified and named, with locality where found. This is by far the most instructive study of any of the mineral exhibits, but being all foreign specimens are excluded from competition.

A magnificent specimen of gold-bearing quartz exhibited by the Chamber of Commerce.

Australian Table.—Ores and minerals, &c., named. We regret the names are in many instances very indistinct. It is a fair exhibit and deserves honourable mention.

Mr. Fletcher's Table.—This, taken as a lot, is a fine collection of ores, minerals, curios, &c., the result of many years' finding, but the want of arrangement, classification, names and localities where found, detract very much from its interest, which might have been made a very interesting exhibit. Mr. Fletcher deserves honourable mention.

Natal Court.—(In feather room).—The specimens exhibited are gold-bearing quartz, labelled, in two cases.—Copper ore, carbonate, not very rich, apparently, no analysis given. Lime and very *pure limestone*.—Coal, anthracite, very similar to the Stormberg coal and probably from the same geological horizon. Honourable mention.

Kimberley Case.—Rock specimens from the Diamond Mines, Agates and other *debris* from the River washings, fossil wood, &c. There is a want of arrangement and classification, although the specimens are very numerous.

Molteno.—Coal and fossil ferns call for no particular notice.

Case of Copper Ore.—Namaqua Copper Company.

Case of Copper Ore—King & Son, for Cape Copper Mining Company.—Specimens of the various ores from the Copper Mines of the Cape Copper Mining Company, well arranged. Honourable mention.

PARTICULARS OF MINERALS AT THE NATAL COURT.

39 large pieces "Pioneer Reef;" 25 small do. do; 3 samples Brickhill's Reef; 3 do. Sheba do.; 2 do. Kidson's do.; 2 do. Victoria do.; 2 do. Caledonia do.; 1 do. Swaziland do.; 1 do. Bruce do.; 1 do. Rosetta do.; 1 do. Natalia do.; 1 do Cameron do.; 1 do. Allan do.; 1 do. Breda do.; 1 do. Beehive do.; 1 do. Middleton do.; 1 lot Lead and Silver Ore, Chamber of Commerce; 1 sample Fossilwood; Coal.

MEMO.—B. G. Lennon exhibited 5 cases, 1 containing Colonial specimens Crocidolite, Molteno Minerals, &c.

Crocidolite, M. Stewart; Asbestos, Chamber of Commerce; Gold and Gold Quartz, Standard Bank (in Kimberley Stand); Sundries from Molteno, also Coal,* Geo. Vice; Saltpetre, J. A. Niekerk, M. Stewart; Fossils, J. S. Brown, Bedford; Fossils, Crocidolite, &c., Geo. Vice; Stones, Ore, &c., &c., J. X. Merriman; Coal,* from Wall Mine Drift, Donald Kay; Copper Ore, Namaqua Copper Company, Cape Copper Mining Company; Copper Ores, J. X. Merriman; 5 Cases Specimens, A. Walsh; Gold-bearing Quartz, Chamber of Commerce; Rock Crystal from Jonas Kopjie, Mrs. Kliefoth; Jasper, Chamber of Commerce; Collection of Specimens, W. H. Scholefield, P. Fletcher, Carl Hanau; Natal Exhibits per memo. attached.

CLASS 15.—Diamonds in Kimberley Court.

* Natal Coal, exhibited by Natal Government Railway; Molteno Coal, Indwe Coal, Cyphergat Coal, Natal Coal, Natal Court.

GROUP B.—MANUFACTURES.

SECTION I.—FROM VEGETABLE SUBSTANCES.

CLASS 17.—Millinery and dressmaking, tailoring and manufactures of cotton, flax and hemp, or other vegetable substances for personal or domestic use.

" 18.—Rope, cordage, tents, hammocks, canvas, or canvas fabrics and paper made from fibre grown in South Africa.

" 19.—Laces, embroideries, crewel work, guipure d'art, macrame, knitting, netting and all kinds of fancy work, dyed, cleaned and scoured fabrics.

" 20.—Brushware, basketware, wicker work, bird-cages, &c.

CLASS 17.

REPORT ON MILLINERY, DRESSMAKING, TAILORING.

Jury.

MESSRS. GEO. KING, S. WHITE, JAMES Y. MCLELLAN.

In submitting our awards in this class, we have to express regret that so few of the large firms engaged in these important industries should have competed, but are pleased (speaking generally) to say that the class of work exhibited is really good, and deserves encouragement. We have carefully examined the workmanship and finish of the various articles, and have awarded as follows:—

Millinery.—Silver medal to Messrs. Cleghorn & Harris for the style and excellency of their exhibits.

Dressmaking.—Silver medal to Messrs. Cleghorn & Harris for the superior style and excellent workmanship.

Ladies' Tailoring.—Silver medal to Mr. T. H. Copeland for the first-class workmanship and high finish of his exhibits.

Underclothing.—Bronze medal to the Lovedale Institution for the excellent work, and also for the great variety of useful articles exhibited.

For best exhibition of the above four classes, "Colonial manufacture," the gold medal to Messrs. A. Dickson & Co. We also beg to suggest that honourable mention be made of Miss Sturrock's, of Peelton, exhibits of native work.

The Manufactures Committee recommend that honourable mention be made of the exhibits in needlework from the Healdtown and Emgwalie Native Institutions.

CLASS 18.

REPORT ON ROPE, CORDAGE, TENTS, HAMMOCKS, MADE FROM FIBRE.

Jury.

MESSRS. JAMES SEARLE, JAMES GORDON.

To nets in particular, comprising a good assortment of the various kinds for fishing or bird catching, we award a silver medal to Robert Slatem, of Port Elizabeth.

CLASS 19.

REPORT ON LACES, EMBROIDERY, CREWEL WORK, GUIPURE D'ART, MACRAME, KNITTING, NETTING, FANCY WORK, DYED, CLEANED AND SCOURED FABRICS.

Jury.

MESSRS. A. DICKSON, JAMES FORDRED.

The exhibitors generally in this Class must be congratulated on the excellent exhibits shown, and on the evident effort made to produce work of such a character as to reflect credit on themselves and the Exhibition. In this they have been eminently successful, and it is hoped that the display made may be the means of furthering and developing the taste for useful and artistic articles in lace, crewel, or other fancy work, which are desirable and attractive in the ordinary household, and profitable as commercial speculations.

The King William's Town Convent furnishes a splendid exhibit in a great variety of different work. They excel in nearly every class. The white chasuble and sash of white silk, worked in raised gold, we consider the finest work in the Exhibition. Their embroideries, crewel work, Guipure lace, hand painted articles, Tambour, hair work, and numerous other exhibits, are all beautifully finished. They are deserving of high commendation for the general superiority of their collection, and we recommend that a silver medal be awarded.

The Holy Rosary Convent, Port Elizabeth, shows a great variety of fancy and useful articles, the majority of which have been made by pupils. The crewel work is very good and the lace very creditable. Some of the exhibits in hand painting are excellent and highly artistic productions. A beautiful piece of raised work on white silk we consider very superior. For the general collection shown, great credit is due to exhibitors, and we recommend that a bronze medal be awarded.

Mrs. Bevan shows a very handsome collection of fancy articles, many of which are made from Colonial shells, seeds, leaves and flowers. Great trouble and care have been taken in the get-up of this exhibit, which forms a very instructive and interesting collection. A bronze medal is recommended.

Miss Sherman exhibits a very pretty case of fancy work, all made by herself; the articles are all well finished and artistically designed. Taken as a collection, the exhibit is one of the neatest in the building, and reflects great credit on the exhibitor. Bronze medal is recommended.

Miss Jessie Moorcroft shows a magnificent piece of hand-made lace. This is really the finest lace work in the building, and would be admired anywhere. For the exquisite finish of this work we recommend a bronze medal to Miss Moorcroft.

(*d*) *Honourable mention* to Graham's Town Convent for Lace Work.

We recommend a bronze medal to Miss K. Symons for her Anglo-Indian embroidery. This work is excellently done.

The following exhibits are awarded honourable mention :—

Miss Harding for macrame and hand-painted work.

Mrs. D. S. Pienaar for knitted work.

The Light Running Standard Machine Company for crewel and fancy work.

Mrs. Filmer for mantel border, made entirely of Colonial shells.

Mr. Hutton for velvet and shell mantel border and brackets.

Mrs. Canel for fancy work.

Mrs. Robertson for shell flowers.

Miss Williams for display of ornaments, &c., made from seeds.

Of Wax Flowers there are several exhibits, all very well made and coloured, but the exhibit by Miss P. Considine is the best. The flowers are beautifully coloured, while the variety is naturally and artistically arranged. Bronze medal is recommended.

Fish Scale Work.—Several excellent exhibits are made, notably Mrs. Strachan's bonnet, trimmed with ostrich feathers, constituting a very pretty and effective ladies' head dress of purely Colonial produce. Mrs. Strachan's work is deserving of honourable mention.

Mrs. W. H. Powell exhibits a very nicely-finished fish scale vase, for which honourable mention is awarded.

Ostrich Egg-shells painted and made into ornamental and useful articles. A number of very pretty exhibits are shown, and at a moderate price we think a considerable trade might be done in these articles. For their display we award *honourable mention to Miss Webber and Miss Mitchley.*

At Savage & Hill's stand Mrs. Saunders was making some very fine specimens of Honiton lace. This is a very interesting and highly instructive exhibit, and will no doubt tend to encourage the manufacture of lace in the Colony. Considering the utility and practical example shown by Mrs. Saunders, we think that she should be awarded a bronze medal.

SECTION II.—FROM ANIMAL SUBSTANCES.

CLASS 21.—Piece goods from woollen material, cloths, tweed and other textile fabrics, wholly or in part of wool.
„ 22.—Articles of dress, such as coats, hats, caps, stockings, socks, cravats, and minor articles in which Cape wool has been used.
„ 23.—Any goods manufactured wholly or in part from Cape mohair.
„ 24.—Leather, tanned, scoured, dressed, dyed, varnished, buffed, chamoised &c. Dressed skins or hides with hair on.
„ 25.—Leather goods, such as harness, saddlery, belting, trunks, dressing cases, bags, purses, and fancy goods of all kinds made of Cape leather.
„ 26.—Boots and Shoes.
„ 27.—Feathers, and Feather trimmings.

CLASSES 21, 22, 23.

REPORT OF PIECE GOODS FROM WOOLLEN MATERIAL—ARTICLES OF DRESS CONTAINING CAPE WOOL, GOODS MADE WHOLLY OR IN PART FROM CAPE MOHAIR—MANUFACTURED IN ENGLAND.

Jury.

MESSRS. C. HANNAM, JOHN ROBERTSHAW, JAMES FORDRED.

In submitting our report on these three classes, we have great pleasure in expressing our entire satisfaction with the quality and the variety of the exhibits, which far exceed our most sanguine expectations. We specially mention the splendid collection shown by Messrs. Savage and Hill, and their praiseworthy efforts to show the various uses to which our wools and mohair could be put, and the excellent quality of goods manufactured therefrom. To Colonists, this exhibit must prove of very great interest, especially to the growers of wool and mohair, and should stimulate our farmers in their efforts to improve their flocks until our wool shall be no longer a reproach to us, but command respect of all European markets. We feel that Messrs. Savage and Hill deserve special distinction for the great variety and excellence of their exhibits, and award them a gold medal for the best collection of fabrics, &c., made at Home from Colonial produce. Their exhibits are so varied, that we cannot separately specify all; but some are of sufficient importance to merit special mention, and award bronze medal for dress and other fabrics manufactured of S. A. materials. These are very good, and compare favourably with goods made from materials produced from other countries.

Bronze medal for shawls made of wools shipped by J. Hodges & Co., Queen's Town; a fine lot of samples, and just the class of goods suited to our requirements

Silver medal for blankets made of coarse and coloured wool shipped from here. At present this class of wool is worth about 2d. per lb. on this market, and is, as these samples prove, most suitable for the manufacture of excellent blankets.

Silver medal for the best exhibits of hosiery made of colonial wool; a very fine lot, and worthy of special mention.

Bronze medal for clothing, &c., made at Home, from wools, &c., exported from South Africa. The whole of these are very creditable.

Bronze medal for men's and boys' hats made by J. Townsend & Co., from Natal lambs' wool. This exhibit is very interesting, as it shows the various stages of manufacture from the raw material to the finished article.

Bronze medal for tweeds, coatings and other goods made of Colonial wools.

Honourable mention is also awarded to Messrs. Savage & Hill for their exhibits in wools in the various stages of manufacture.

Messrs. Longworth & Bairstow exhibit some splendid specimens of tweeds from the factory of Evans & Co., made from wools exported from this country; these goods are of special merit, being very suitable for Cape requirements. We award silver medal for the excellence and suitability of their exhibits in this class.

In Class 23, MOHAIR GOODS, there are some very fine samples shown, and those of Mr. John Hall are simply splendid. His exhibits prove that our mohair is suitable for the manufacture of the highest class goods, as illustrated by the beautiful specimens in various coloured plushes, &c., which have excited the wonder and admiration of every intelligent observer, and especially of our Angora farmers. As a special distinction we award *Mr. John Hall a gold medal* for superior exhibits in this class, and a bronze medal for the very interesting exhibits of mohair in the various stages of manufacture.

In concluding our report, we wish to point out that it was impossible for us to mention every exhibit in detail; and we place on record our regret that among the exhibits we find no cotton or silk goods, these two important classes being represented by the small exhibits of Valentine Bros. and Wm. Holdstock. It is a matter of fact that cotton can be grown in South Africa equal to the Sea Island, and silk equal to the best Italian, the climate and soil being admirably adapted for the production of both. The question naturally occurs to us, should we not manufacture them ourselves? The trade in blankets is a large and important one, and should be able to support at least one good factory in the Colony. Take the value of the raw material from which the above blankets are made, and charges amounting to almost as much before it reaches the manufacturer, add manufacturer's profit and a heavy duty in order to get back our own wool in the form of blankets, it will be at once perceived that we ought to soon become exporters of blankets at 1s. 6d. per lb., instead of the raw material at 2d.

CLASSES 24—25.

REPORT ON LEATHER, TANNED, SCOURED, DRESSED, DYED, VARNISHED, BUFFED, CHAMOISED; DRESSED SKINS OR HIDES, WITH HAIR ON; HARNESS, SADDLERY, BELTING, MADE OF CAPE LEATHER.

Jury.

MESSRS. P. P. ARCHIBALD, H. MAPPLEBECK, J. R. RUMSEY.

In reporting upon these two classes we have much pleasure in expressing our satisfaction with the number and general quality of exhibits, the show of Colonial leather being exceedingly good.

In leather goods there are some excellent specimens of Colonial workmanship, both in harness and saddles, but the show of such articles as saddle bags, valises, hand bags, leggings, &c., is very small, and a large number of useful articles omitted altogether.

Dressed Leathers.—In awarding the various prizes we place them in the following order:—

1st prize to Mossop and Garland, Cape Town, for general excellence and great variety. We are especially pleased with this collection, and suggest that they receive a gold medal instead of a silver one, as we consider their exhibits deserve such a distinction.

2nd prize to William Jones and Co., Port Elizabeth.—We suggest a silver medal, as the exhibits are very good indeed. Although there is room for improvement in several of the articles and the variety not so great, yet their show is very creditable indeed, and of decided merit.

Bronze medal to Walter Lane, Port Elizabeth, for Colonial skins, dressed in England. A very fine lot of specimens, showing the state of perfection to which Colonial skins can be worked up if exported in a sound and well cured condition.

Honourable mention—A. Lyle, Pietermaritzburg, for brown rein backs and harness leather. These are remarkably good, and deserve special mention, but the rest of their exhibits are inferior, and very limited.

Special.—The leather exhibits of Messrs. Savage & Hill, although not entitled to any prize, deserve special reference, as being of a most useful and instructive nature; they clearly illustrate the evils of scab, bad flaying, &c., which tend so much to depreciate the value of the raw material in the Home market. Such convincing proofs should have some beneficial effect, and Messrs. Savage & Hill are to be highly commended for their efforts to improve such an important article of export.

Bronze medal to B. P. Titherington, Port Elizabeth, for Colonial skins dressed in the Colony. Well-dressed and dyed.

Honourable mention to Mossop & Garland, Cape Town, for Colonial skins dressed in the Colony.

Honourable mention to Savage & Hill for Colonial skins dressed in England.

Leather Goods.—*1st prize (silver medal) to G. Eirwood, King William's Town*, for the best show of Colonial-made harness of Colonial leather, also including a very handsome set of carriage harness made of English leather, but entirely of Colonial workmanship.

Also

1st prize (*silver medal*) for the best collection of Colonial-made saddlery, including specially lady's and gent's saddles, made entirely of Colonial leather, and of excellent workmanship.

2nd prize (*bronze medal*) *to City Saddlery Works, Cape Town*, for general excellence and variety of exhibits This collection includes valises, saddle-bags, beltings, and a variety of useful articles, which deserve special mention for style and good workmanship.

Bronze medal to J. P. Cupido, Paarl, for the best alum leather and Boer harness, the quality of leather and workmanship being excellent, and the class of harness one of the cheapest and most useful in the Colony.

Honourable mention to M. Maloney, King William's Town, for good workmanship in harness of various kinds, but the leather used in the manufacture of these being entirely English, we are unable to award any prize. The exhibits are very well got up, and do credit to the exhibitor.

There are several other exhibits in leather goods, but not of sufficient merit or variety to require special mention.

Taking the exhibits in leather and leather goods altogether, we consider them very satisfactory indeed; in fact, with such fine specimens before us, we are of opinion that in the near future we should not only cease to be importers, but become exporters of the class of goods now reported upon.

CLASS 26.

REPORT ON BOOTS AND SHOES.

Jury.

MESSRS. P. P. ARCHIBALD, W. BELDON, P. BARNETT.

In reporting on this class, we must express our great disappointment at the very small number of exhibitors and lack of competition in an industry which is practised throughout the whole of South Africa, and more especially when we consider that it is one of the few enjoying the advantage of special protection, through very high duties being levied upon all similar goods imported, and for which such excellent materials are manufactured in the Colony.

There are only four exhibitors in this very important class, namely, one from Cape Town, one from Graham's Town, and two from Port Elizabeth, whereas at least ten or twelve could reasonably have been expected. The two most important exhibits are those of Wm. Jones & Co., Port Elizabeth, and J. Garlick & Co., Cape Town, these being entirely of Colonial material and workmanship, Wm. Jones & Co. showing superior workmanship, and J. Garlick the greatest variety. In awarding prizes, we place them in the following order of merit:—

1st Prize.—Silver medal, Wm. Jones & Co., for Colonial-made Boots and Shoes, entirely of Colonial materials. These goods are well suited to the requirements of the country, and both workmanship and material are good.

2nd Prize.—Bronze medal, John Garlick, Cape Town, for Colonial-made Boots and Shoes of Colonial material and workmanship. This

exhibit comprises a very large variety of well-made goods, of which a large proportion is well suited to our Colonial requirements.

Imported boots and shoes, of Colonial materials, are not represented at all, but Bisseker, George & Co., of Port Elizabeth, and D. Knight & Co., of Graham's Town, show some very good samples of various kinds of boots and shoes, some being entirely of English leather, partly made in England, but soled and finished here; others with English leather, tops made in England, and soled here with Colonial leather; the Colonial workmanship is very good, and worthy of special mention. We regret, however, that they do not exhibit any goods manufactured entirely in their own factories, and cannot award any prize for their exhibit.

CLASS 27.

REPORT ON FEATHERS AND FEATHER TRIMMINGS.

Jury.

MESSRS. WM. SAVAGE, A. DICKSON, JAMES BRISTER.

The judges are somewhat surprised at the very meagre exhibits in this class, there being only two competitors.

It is astonishing, considering the facilities offered here for the production of dressed feathers at a cheap rate, that by far the larger portion are imported from Europe, the ordinary local price being excessive, and the finish inferior to that of the imported article.

A bronze medal is awarded to the exhibit of Mr. H. J. Smith, which is in fair variety, and very creditably finished.

SECTION III.—MANUFACTURES OF ARTICLES OF CONSUMPTION.

CLASS 28.—Meal from Wheat and Mealies (Maize), and Kafir Corn (Millet) or other grain. Flour from wheat, &c. (The flour-producing properties of different descriptions of Colonial Wheat should be clearly indicated.) Pollard, Bran, and all products of grain grown in South Africa.

" 29.—Bread, Biscuits, Fancy and Ornamental Pastry.

" 30.—Butter, Cheese, Lard and Honey.

" 31.—Jams, Preserves, Dried and Preserved Fruits and Vegetables.

" 32.—Pickles, Sauces, Curry Powder, Mustard, Cayenne Pepper, Arrowroot, &c.

" 33.—Sugar, of various representative qualities, and its products, such as Confectionery, &c.

" 34.—Fish, dried, smoked, cured, tinned, &c.

" 35.—Wines, Spirits, Beers, Vinegars, Cider, Cordials, Liqueurs, Bitters and Syrups.

" 36.—Mineral, Natural and Artificial Aerated Waters.

" 37.—Manufactured Tobacco, such as cake, stick, cut, rolled, &c. Snuffs, plain and fancy, mixed and unmixed. Cigars and Cigarettes.

CLASS 28.

REPORT ON MEAL FROM WHEAT AND OTHER GRAIN, FLOUR FROM WHEAT, POLLARD, BRAN.

Jury.

MESSRS. WM. BURLS, JOHN WHITE, JOHN PYOTT.

We have given this class of exhibits our very best attention, and found great difficulty in arriving at a decision, the quality of the exhibits being very even, and equal to any we have seen exhibited in this country.

We understand that the medals are to be awarded to exhibits manufactured from Colonial-grown grain only, and accordingly recommend the following award of medals :—

Messrs. E. & J. Atmore, gold medal, this meal and flour being the best exhibited.

J. J. Joubert, silver medal for the next best meal and flour from Western Province wheat.

Geo. Vice, silver medal for best meal from Eastern Province Wheat.

Letterstedt & Co., silver medal for good variety of meal and flour.

G. Oosthuysen, honourable mention for good sample of nearest approach to Boer meal.

Geo. King & Son, honourable mention for mealie meal.

G. H. Dumbleton, bronze medal for Colonial oatmeal. A very good sample, but can be improved by better machinery.

Natal Court, bronze medal for arrowroot, which is a very good sample both in appearance and quality.

The following exhibits are not manufactured from Colonial-grown grain, and we are therefore doubtful if they come within the competition. If they are allowed to come in we beg to recommend the following :—

A special gold medal to the Port Elizabeth Steam Mill Company for flour. This is superior to all the other exhibits, whether from Australian or Colonial grain.

E. & J. Atmore's meal from Australian wheat, the best of this class, but as we have already awarded them a gold medal we simply mention this fact.

CLASSES 29, 30, 31, 32, 34.

REPORT ON BREAD, BISCUITS, FANCY AND ORNAMENTAL PASTRY, BUTTER, CHEESE, LARD, HONEY, JAMS, PRESERVES, DRIED AND PRESERVED FRUITS AND VEGETABLES.

Jury.

MESSRS. HENRY DOWSETT, R. HALLACK, W. C. DUNCAN.

CLASS 29.

Bread.—No samples.

Biscuits.—G. Pyott, 22 kinds. Best exhibit, but nothing worthy of special commendation.

Fancy and Ornamental Pastry.—Nothing worthy.

CLASS 30.

Butter, Cheese and Lard.—No samples shown us.

Honey.—*C. Rigg*, some good samples. *A bronze medal.* *Dr. Stroud*, some good samples in comb. *A silver medal.*

HIVES AND HONEY.

NOTE.—The Executive Committee have *specially awarded a silver medal to Dr. J. W. Stroud* for his whole exhibit of hives and honey, in lieu of the bronze medal already given for honey only. This is in recognition of his efforts in the promotion of Bee-management.

CLASS 31. (*a*)

Jams.—The exhibits under this head were very good, and we consider those of *J. J. Hill & Co., of Cape Town*, best in quality for assortment and price. *A gold medal.* *Glass Bros., honourable mention.*

CLASS 31. (*b*)

Dried and Preserved Fruits.—*Jameson & Co., a silver medal; Kelly & Co., a bronze medal; Mrs. Edwards, a bronze medal.*

Vegetables.—No exhibit.

Dried Fruits.—*Marais*, the best loose and stalk raisins, *a bronze medal.* *J. D. Cartwright & Co., special mention* for Colonial dried currants.

CLASS 32.

Pickles, Mustard.—None.

Sauces.—*A. Brookes, bronze medal.*

Curry Powder, Cayenne Pepper and Arrowroot.—No competition for the two last-named articles.

Curry Powder.—Of two exhibits we consider the *Natal* assortment very good and the best. *A bronze medal.*

CLASS 34.

Fish, Tinned.—A few tins only exhibited by Mrs. McLachlan (no competition).

CLASS 33.

REPORT ON SUGAR, OF VARIOUS REPRESENTATIVE QUALITIES, AND ITS PRODUCTS, SUCH AS CONFECTIONERY.

Jury.

MESSRS. CHARLES HANNAM, ALBERT LEHMANN, HENRY FORBES.

The above class was represented by four exhibitors, viz.: John Pyott, of the P. E. Steam Confectionery Works; J. J. Hill & Co., Cape Town; W. C. Jones & Co., King William's Town; and the Natal Court.

On reference to the list of medals, we regret to find that no gold medal is amongst the awards for these exhibits, as we consider the industry the most important and growing one. Added to this the

exhibits are so good that we found great difficulty in deciding how to award the medals offered, viz.: one silver and two bronze, and would recommend, if it be possible for the Executive to arrange it, that a gold medal be awarded as first, silver second and bronze third.

The order of merit we find as follows: *John Pyott, of P. E Steam Confectionery Works, first*, his exhibits comprising the largest variety of confectionery, and in quality the best. *J. J. Hill & Co., second*. The quality of these exhibitors' confectionery is so nearly equal to that of John Pyott that but for the larger variety of Pyott's exhibits we should have found a difficulty in deciding as to which was first. Messrs. Hill & Co.'s collection of show bottles, and the way they are exhibited, are worthy of special mention. *W. C. Jones & Co., of King William's Town, third*. This exhibit was much smaller than the others, but the quality of boiled and other goods is very good indeed, and we would award a bronze medal for the extreme fancy confectionery, imitation of French, &c. Natal Court exhibit was very small indeed, and not worthy of any special mention.

CLASS 35.

REPORT ON WINES, SPIRITS, BEERS, VINEGARS, LIQUEURS, BITTERS AND SYRUPS.

Jury (A).

MESSRS. CARL VON BABO, W. T. KINGSMILL, HENRY DOWSETT, J. B. RUMSEY, J. E. LANDRY.

WINES (A).

Hocks.—Of the twelve samples submitted, only one was selected, most of them being too highly fortified and sweet, and not bearing the character of the wine.

Sherry.—Twenty-seven samples—seven were selected. Some of them were sour, others too sweet; some undergoing fermentation, and the majority too highly fortified.

Madeira.—Three samples.—The one selected was a very fair Cape Madeira.

Hanepoot and Stein Wine.—Six samples.—Four selected. Good flavour and sound; all worthy of commendation.

Muscatels.—Nine samples.—Six selected. Pretty good, sound wines.

Frontignac.—Six samples.—Five selected. Fair and sound.

Clarets.—Six samples.—Four selected. Sound, but not all bearing the character.

Sauterne.—Four samples.—One selected, but not to be classified under this head.

Unfortified Wines.—Seven samples.—Five selected. Sound.

Dry Pontac.—Five samples.—One selected. The remainder were somewhat sweet, stalk-flavoured, and two spirity.

F. C. Pontac.—Seven samples.—Five selected. Good and fairly sound fruity wines.

Sweet Pontac.—Seven samples.—Five selected. Fair in quality; fruity but rather too syrupy.

Cape Port.—Nine samples.—None of these come under the head of Port, but rather of Pontac.
Champagnes.—Two samples.—Not at all creditable.

General Remarks.—Most of the wines were cloudy, not sufficiently fined. Some under the headings of pale were dark, and others submitted as dry were sweet. We regret the absence of good, dry Sherries; also of a good still Hock, all not too highly fortified. In many of the wines there was an excess of tannin, which may be attributed to carelessness in the fermentation.

Annexed will be found our decision, in which the particulars given of marks and descriptions are as labelled on the respective samples.

DECISION OF WINE JUDGES.

The following are selected as the best from the various samples submitted:—
Hock. – M considered best.
Sherry.—F, fine dry Sherry. Sherry.—E P P, E X X, R C S C, C F C No. 1, E Golden, G Sherry B.
Madeira.—E, sample fair; others not good. G. Hangoot; R, Old Stein; F, Constantia; B, Red Constantia.
Muscatel.—Q, Red, sweet; R, Red, sweet; Q, White, sweet; F, White, sweet; A, Red, dry; E, Red, dry; F, Groenberg.
Frontignac.—E, F, B, C, R.
Claret.—R, E, B, C.
Sauterne.—E, good dry wine, but not Sauterne; F, Drakenstein, nice Hock, but too sweet.
Unfortified Wines.—P, Sweet Pontac; P, Dry Pontac; P, Dry Muscatel; P, Sweet Muscatel; P, Grond Green Grape.
Dry Pontac.—C.
F. C. Pontac.—R, E, C; G (A. Pontac); Esp.
Sweet Pontac.—R, Constantia; G, Sweet; B, Sweet; C, Sweet; E, Constantia, F. P.
Champagne.—Very inferior.
Port.—None of the wines submitted under this head were of the character of Port.

Jury (B).

MESSRS. W. T. KINGSMILL, HENRY DOWSETT, E. J. MEYER, J. E. LANDRY.

BRANDIES (B).

The following are selected as the best from the various samples submitted:—
Cape Brandies (17 samples).—We consider B Worcester and C Dop the best; and L Colonial B and K Colonial B two good pure brandies, but young. We commend M Dop and recommend A Cape and O Cape as flavoured brandies. We are, however, disapppointed at the poor display of pure Cape brandies.
Cango Brandies.—Five samples were selected. A as best, E & G good, and, in our opinion, equal.
F. C. Brandy.—Three samples.—E we place first, but a very poor selection.
Cognacs.—Nine samples.—We select DRF and A, and would give preference to F.

***Ginger Brandy.*—Four samples.—B a good ginger brandy.**
Whisky.—Two samples.—No mention.
Rum.—Two samples.—**Natal sample very good.**
Cape Hollands.—One sample.—Recommended.
Liqueurs.—Eighteen samples.—The nine selected—Van der Hum, C double, Curaçoa, C Cloves, E Benedictine, E Creme de Vanilla, E Allasch, E Kummell, G Anisette cordial, F Anisette brandy—we consider fair quality, and give preference to E Benedictine, but all are more or less objectionable from the strong flavour of Cape brandy.

The initials on the labels referred to in the above report represented exhibitors as follows:—

A. Messrs. J. S. Aspeling & Co.
B. Mr. Henry C. Collison.
C. The P. E. Wine Association.
D. Messrs. D. Cloete & Co.
E. The Paarl Wine and Brandy Company.
F. Messrs. E. K. Green & Co.
G. Messrs. J. Sedgwick & Co.
H. Mr. John S. Parkes.
K. „ F. Weitz, sen.
L. „ F. Weitz, jun.
M. „ P. Toens.
N. „ A. H. du Toit.
O. „ T. H. Heatlie.
P. The Montagu Committee.
Q. Mr. H. Gilmour.
R. Messrs. J. H. and J. van Ryn.

EXECUTIVE SUB-COMMITTEE (A).

MESSRS. W. SAVAGE, E. CASTENS, C. T. JONES' AWARD.

In (A) Wines.

To the Paarl Wine and Brandy Company (cipher E), for the best general exhibit of wines, *gold medal.*
To Messrs. J. H. and J. van Ryn (R), for general exhibit, *silver medal.*
To the P. E. Wine Association (C), for general exhibit, *silver medal.*
To Messrs. E. K. Green & Co. (F), for general exhibit, *silver medal.*
To The Montagu Committee (P), for their unfortified wines, *special silver medal.*
To Mr. P. Toens (M), for hock, special *bronze medal.*
To Mr. H. C. Collison (B), for general exhibit, *honourable mention.*
To Messrs. J. Sedgwick & Co. (G), for general exhibit, *honourable mention.*

In (B) Brandy, &c.

To Mr. H. C. Collison (B), and the *P. E. Wine Association* (C), *silver medal* each for exhibit of Cape brandy.
To Mr. F. Weitz, sen. (K), *honourable mention* for Cape brandy.
To Mr. F. Weitz, jun. (L), *honourable mention* for Cape brandy.
To. Mr. P. Toens (M), *honourable mention,* for Dop brandy.

To Messrs. J. S. Aspeling & Co. (A), and *T. H. Heatlie* (O), *honourable mention* for flavoured brandy.
To Messrs. J. S. Aspeling & Co. (A) for Cango brandy, *silver medal.*
To the Paarl Wine and Brandy Co. (E), for Cango brandy, *honourable mention.*
To Messrs J. Sedgwick & Co. (G), for Cango brandy, *honourable mention.*
To Messrs. E K. Green & Co. (F), for Cognac brandy, *silver medal.*
To Messrs. D. Cloete, J. H. & J. van Ryn and J. S. Aspeling & Co., honourable mention for Cango brandy.
To M. H. C. Collison (B), for Ginger brandy, *bronze medal.*
To Messrs. J. H. & J. van Ryn (R), for Cape Hollands, *honourable mention*
To the Natal Committee for Natal rum, *bronze medal.*

In (C) Liqueurs.

To the Paarl Wine and Brandy Co. (E), for Benedictine liqueurs, *silver medal.*
To the Paarl Wine and Brandy Co., for Creme de Vanilla, Sillasch and Doppell kummel, *honourable mention.*
To Messrs. J. H. & J. van Ryn (R), for Van der Hum, *honourable mention.*
To the P. E. Wine Association (C), for double Curaçoa, *honourable mention*
To Messrs. J. Sedgwick & Co. (G), for Anisette cordial, *hon. mention.*
To Messrs. E. K. Green & Co. (F), for Anisette brandy, *hon. mention.*

Jury (D).

MESSRS. O. CRAWFORD, JOHN HORTON, W. PHILLIPS.

ALE AND STOUT.

We have carefully examined the ales and stout in bottles and on draught. The bottled ales are mostly of good quality, the draught ales not quite so good. We regret we cannot say as much for the porters and stouts, which are, with but one exception, unworthy of commendation. The draught stout of Messrs. Cloete & Co. is a fairly good article.

We recommend the following awards :—
To Messrs. Cloete & Co. a *silver medal* for bottled and draught ale.
To Messrs. Letterstedt & Co. a *silver medal* for bottled ale.
To Messrs. J. H. & J. van Ryn a *bronze medal* for bottled pale ale.
To Messrs. Ohlsson & Co a *bronze medal* for export draught ale.

Jury (E).

MESSRS. W. SAVAGE, R. RYALL, E. CASTENS.

COLONIAL VINEGAR.

There are only two exhibits of Colonial vinegar, those of the Paarl Wine and Brandy Company and *Mr. O. Crawford, of Port Elizabeth.* These are both very good of their kind, but we consider Mr. Crawford's the best for general purposes, and therefore award him a *bronze medal*, giving *honourable mention* to the *Paarl Wine and Brandy Company.*

Jury (F).

Messrs. F. E. Constance, W. Phillips, Dugald Sinclair.

BITTERS.

We have carefully examined the Bitters brought to us under cipher, and find *Messrs. H. C. Bell & Son*, Graham's Town, exhibit the best sample, and award them the *bronze medal*.

The Stomachic Bitters of *Messrs. J. H. and J. van Ryn*, Cape Town, highly commended.

We would have liked to have seen more competition in actual Bitters. The majority of those exhibited are Cordials, and not Bitters, in the true acceptation of the term.

Australian Hop Bitters (not for competition) very fair, but failing in strength of the essential.

CLASS 36.

REPORT ON MINERAL, NATURAL AND ARTIFICIAL AERATED WATERS.

Jury.

Messrs. F. E. Constance, W. Phillips, E. George.

Leslie & Son's exhibit for aerated waters most in use, and declared to be the best.

Uitenhage Mineral Water Company's ginger ale and ginger beer highly commended.

White & Morgan's seltzer and tonic water highly commended.

B. G. Lennon & Co.'s (East London) lemonade and lithia highly commended.

H. C. Bell's (Graham's Town) gingerade, limeade and roseline (no competition) highly commended.

J. H. Drury & Co. show the best sample of lemon syrup.

H. C. Bell's (Graham's Town) syrup preparations and cordials are very superior, with little or no competition.

We would wish to state in judging these samples they were all under cover and strictly guarded by a gentleman appointed by the Committee, to see that no fear, favour or prejudice was brought to bear on the manufacturer, and until we had finished our examination we did not know who the successful exhibitor was. We recommend, in accordance with above reports, a *bronze medal* to *Leslie and Son* for aerated waters; a *bronze medal* to *J. H. Drury and Co.* for lemon syrup; a *bronze medal* to *H. C. Bell* for syrup preparations.

CLASS 37.

REPORT ON MANUFACTURED TOBACCO, IN CAKE, STICK, CUT, ROLLED,—SNUFFS, CIGARS, CIGARETTES.

Jury.

Messrs. Joseph Walker, John C. Kemsley, Richard Powell.

Tobacco in quantities in Leaf.—We are unable to adjudge this prize as required by the Prize List, there being no competition. There were

but two samples in leaf shown, one from Natal (4 cwt.) and a small parcel shown by Mr. Drury on account of the grower, Van Wyk. The former was of fair quality, but neither was up to the standard to justify an award of the gold medal. We may here express our disappointment and regret that there were not more exhibits and a keener competition for this raw product, of which such large quantities are required by the trade. The only other exhibit of tobacco in quantity was cut Transvaal, which, with other exhibits of the same article in lesser quantities, did not come up to a moderate standard of excellence, and seeing that there is a most general inclination to use this tobacco, we consider the exhibits most disappointing. The *gold medal* under the above head not having been appropriated, we recommend that it be given to *Messrs. Cohen and Schmidt as a special prize.* Their whole stand, containing tobacco manufactures of every description, especially cigars, all manufactured in the Colony, tastefully got up in boxes and packets, also of Colonial manufacture, with labels printed in the Colony, was most commendable and worthy of marked recognition, and fully entitling them, in our opinion, to this gold medal.

Cigars.—*Messrs Cohen and Schmidt's* exhibit of cigars in the whole range of seven different qualities is superior to any Colonial manufacture we have seen, and to them we award a silver medal for cigars for 1st Prize; and to *Messrs. J. H. Drury & Co.* for an excellent exhibit of the same goods we award a *bronze medal.*

Cigarettes.—The competition was practically between Messrs. Hermann & Canard and Messrs. Samuel Nathan & Co. The quality of both was about equal, but in consideration of *Messrs. Hermann & Canard's* exhibits containing a larger variety of good qualities, we award a *bronze medal* to them, and recommend a certificate of *honourable mention* be given to *Messrs Samuel Nathan & Co.*

Snuff (*made of imported Tobacco*). The competition for this was between *Messrs. Landsberg & Co.* and *Messrs. J. H. Drury & Co.* The snuff was of good quality, and we recommend that a certificate of *honourable mention* be granted to both.

Snuff (made of Colonial Tobacco) of comparatively excellent quality was exhibited by *Messrs E. Ebert & Co.* and *Messrs. Samuel Nathan & Co*, and we recommend that a certificate of *honourable mention* be given to both these firms.

Colonial Tobacco.—We award a *silver medal* to *Messrs E. Ebert & Co.*, whose exhibits in quality and variety were superior, the tin boxes and labels being all of local make. We award a *bronze medal* to *Messrs Nathan & Co.*, the quality of whose tobacco was about equal to the former, but the variety not equal, and the packages in some respects being imported. We beg to call special attention to an exhibit of Messrs. E. Ebert & Co. of pipes, upwards of 40 dozen, manufactured in Europe from Colonial grown wood, viz.: karea and beefwood, the former being indigenous. The pipes are of various shapes, style and quality, varying in price from 10s. 6d. to 60s. per dozen and upwards. A sample of beefwood was exhibited, and pipes in various stages of manufacture from the rough to the finished article. In consideration of the utilization of Colonial woods for a purpose of very general use capable of extensive development, not only in this country, but for trade purposes generally, we strongly recommend that *a silver medal* be awarded to *Messrs. E. Ebert & Co.* for the enterprise. The exhibit of tobacco manufactures from Brazils by Messrs. Savage & Hill

forms a very excellent means of comparison with our colonial manufactures. The range of qualities of cigars and cigarettes was most varied, and among the better qualities a very marked degree of excellence was obtained. Not being of Colonial manufacture or growth, this exhibit could not enter into competition, and we were, therefore, precluded from awarding a medal or certificate of honourable mention.

SECTION IV.—ARTICLES OF GENERAL UTILITY.

CLASS 38.—Soap, manufactured. Fine rock or pan Salt. Candles.
" 39.—Oils, Perfumery, Scents, Blacking. Artificial Manures.
" 40.—Bookbinding, Account-book Manufacturing, Ruling, Printing by Letterpress, Lithography, Copperplate Engraving, Dye, Cameo and Relief Stamping, &c.
" 41.—Paper, also manufactured into various useful and ornamental articles.

CLASS 38.

REPORT ON SOAP, MANUFACTURED, FINE ROCK OR PAN SALT, CANDLES.

Jury.

MESSRS. O. CRAWFORD, F. W. HOPE, J. M. LESLIE.

In submitting our awards on these items, we regret that on such important industries as soap and candles so little competition has been excited.

It is, perhaps, hardly within the province of a judges' report to dilate on the causes of such indifference, but we cannot refrain from pointing out that until this country rears a much larger quantity of fat stock, such industries must necessarily languish from the want of a principal material.

Salt.—A natural product, bountifully supplied in so pure a state as to require little more than collecting and grating. It would be tedious to enumerate the various samples sent in, distinguished principally by the presence of a variable quantity of sand and soil, or by small quantities of other salts more interesting to the chemist than to the public.

The samples exhibited by Messrs. Uitzeroth Bros. (Groot Pan) and those from the Bethelsdorp Salt Pan are closely allied in quality. The Bethelsdorp salt, however, is slightly moister, has a trace of bitterness, and is barely so bright and clean as the Groot Pan salt. We recommend, therefore, that the *silver medal* be awarded to *Uitzeroth Bros.*, and the *bronze medal* to the *Bethelsdorp Salt Works.*

Candles.—There is but one exhibit of South African Candles. Mr. G. Brown, of the Nucleus Works, shows a composite berry wax candle.

This is a good candle for household use, being slow burning and giving a good light. Mr. Brown shows stearine candles as well.

Soap.—Only two commercial exhibits in competition Mr. G. Brown has a primrose soap, bright, clean and dry ; a creditable production. He has also a scouring serviceable soap, for coarse purposes.

Mr. Russell Hallack shows a good useful household soap, free from excess of water.

Mr. J. J. W. van Zyl sends samples of caustic soda and Boer soap of good colour and quality.

Mr. D. Schalk Pienaar sends the best sample of Boer soap of good colour.

The Australian exhibits of soaps, candles, glycerine, &c., showing the advancement made there in these industries, deserves the scrutiny of visitors.

We recommend, therefore, that for his combined exhibits of soap and candles there be awarded to ***Mr. G. Brown the silver medal, Mr. R Hallack a bronze medal, Mr. J. J. W. van Zyl a bronze medal, Mr D. S. Pienaar a bronze medal,*** and ***honourable mention*** of the Australian exhibits.

In closing this report, we think it a duty to draw the attention of farmers to the making of caustic soda soap. By the aid of a small drum of caustic soda any farmer can make a fairly good soap with the tallow from his own farm.

CLASS 39.

REPORT ON OILS, PERFUMERY, SCENTS, BLACKING, PAINTS, ARTIFICIAL MANURES.

Jury.

MESSRS. JAMES W. STROUD, M.D., F. E. CONSTANCE, J. L. REELER.

The exhibits of scents and perfumery are confined to those shown by B. G. Lennon & Co., of Port Elizabeth, and Mr. H. C. Bell, of Graham's Town. Having carefully examined these we award *Messrs. B. G. Lennon & Co.* the *silver medal* for the variety, excellence and cheapness of their manufactures, especially their Toilet Vinegar, Florida Water and Eau-de-Cologne, which are of very fair quality, and quite equal to many importations of these articles. The spirited effort of this establishment to compete with foreign perfumery deserves the highest praise.

We have awarded Mr. H. C. Bell a bronze medal for his very superior Lavender Water, Patchouli, &c., and highly commend the very neat and elegant way in which his many toilet preparations are put up and finished for sale.

Messrs. J. & C. Hedding, of King William's Town, make a good show of Ultramarine Blue, which is of Colonial manufacture and deserves great credit ; so also does their Blacking and Anti-Corrosive Paints. We notice a number of tins marked "mixed coffee," but as the tins are empty we are unable to judge of the coffee

Mr. Parent, Cape Town, shows a great variety of herbs, leaves and bulbs, most of which is Colonial. The exhibitor should have been

present to inform the judges of their active properties, &c. (if any). There was a quantity of Colonial Whiting exhibited of very fair sample. This doubtless might be utilized in the Colony for various purposes.

Mr *J. M. Leslie* shows a large assortment of private nostrums, together with an unique medicine chest for camp and field, containing selected medicines, which is deserving of great praise and encouragement. Mr. Glennie shows a very good sample of neats foot oil. As the quantity of oils exhibited is so small we do not feel justified in giving any award. We should like to have seen some samples of artificial manures, and were rather disappointed at finding none.

The Manufactures Committee recommend a *bronze medal* to *J. & C. Hedding*, of King William's Town, for their exhibits of paints, blue and blacking, also *bronze medal* to *J. M. Leslie* for exhibit of medicines and medicine chest for camp and field.

JAS BRISTER, Chairman.

UNCLASSED.—CHEMICAL PREPARATIONS.

Jury.

MESSRS. D. HUTCHEON, M.R.C.V.S., J. W. STROUD, M.D., C. LEE.

SHEEP DIPS.

1st. *Gillard's Dip.*—The active ingredients of this Dip being insoluble in water, when mixed according to directions, the dip cannot be kept of a uniform strength without constant vigorous stirring. The judges therefore cannot recommend this dip.

2nd. *Calvert's Carbolic Sheep Wash.* This is a very clean dip, the carbolic acid being perfectly soluble when mixed as directed; but in the opinion of the judges, the fluid is too watery, and would, in consequence, be liable to run off the sheep too rapidly to be effective in killing the acari. This may be remedied by keeping the sheep in the dip two minutes as directed, but the judges are of opinion that one minute in the dip is as long as the sheep can be kept without injury.

3rd. *The Glycerine Dip.*—This is a very effective dip, but the active ingredients are not completely soluble in the mixture when prepared as directed. A certain portion rises to the top. This would make it very possible for the sheep that were first dipped to carry out a larger proportion of the active ingredients than those that were dipped later.

4th. *Little's Sheep Dip* (Patent).—This is a very effective dip, the active ingredients being perfectly soluble. When the mixture is prepared as directed the dip remains a uniform strength throughout, but the judges are of opinion that it has rather more body than is desirable, as the thick fluid adhering to the fleece would tend to cause an accumulation of dust and dirt, which would still further damage the fleece.

5th.—*McDougall's Sheep Dip.*—This is an equally effective dip to the others. It is an excellent mixture when prepared as directed, the ingredients being perfectly soluble. It is not so thick as either the Glycerine or Little's Dip, while it has a more lubricating and soapy feel than either. This property would exercise a softening effect upon the scabs in bad cases, which is a very desirable quality.

6th.—*Cooper's Dipping Powder.*—This is a very effective dip, and it has the advantage that it injures the wool but very little. This is a point of very great importance. It has, however, the disadvantage of not being a perfect mixture, some of the active ingredients not being soluble when prepared as directed. This necessitates constant stirring while being used. It is also necessary to carry out the directions carefully with respect to dipping and draining, on account of its poisonous nature.

The judges are of opinion that the qualities essential in a really first class dip are . (*a*) That it shall effectually destroy the acari ; (*b*) That it shall be uniform in strength and safe to use ; and (*c*) That it shall not injure the fleece. None of the dips exhibited completely fulfil those conditions. The judges, however, recommend that *silver medals* be given to *Cooper's Dipping Powder* and *McDougall's Sheep Dip*, and a *bronze medal to Little's Patent Sheep Dip.*

In connection with the above report the Manufactures Committee draw attention to the excellent drawings, made by Dr. Stroud, of the various insects detrimental to sheep and other animals, and tender him their thanks for his efforts to assist the farmers in eradicating the scab from their flocks.

A. Dickson, Honorary Secretary of
Manufactures Committee.

CLASS 40.

REPORT ON BOOKBINDING, ACCOUNT BOOK MANUFACTURING, RULING, PRINTING, LITHOGRAPHY, COPPER-PLATE ENGRAVING, DIE, CAMEO AND RELIEF STAMPING, &c.

Jury.

Messrs. James Kemsley, E. H. Walton, Alfred J. Hicks.

We regret to find that in Class 40 there is so little competition. In fact the only collection worthy of notice is that sent from the *Lovedale Training Institution.* There are some fair specimens of printing and bookbinding, and as much of this is entirely of native workmanship, we consider the exhibits in the highest degree creditable to that Institution. We recommend that a *silver medal* be awarded for this collection.

Mr. L. Weinthal is the only exhibitor of lithographic work, and in commending his efforts we recommend that he receive a *bronze medal.*

SECTION V.—ARTICLES MANUFACTURED OF WOOD.

CLASS 42.—Furniture, Cabinetware and Upholstery of every description.
,, 43.—Wood-turning in all its branches, such as Chair and Table Legs, Moulds and Patterns, Ornamental Work, separate parts of Furniture, &c., &c., made with the Lathe.
,, 44.—Carpenters' and Joiners' work, in all branches, such as Doors, Windows, Chimney Pieces, Panels, Mouldings, Trunks, Cases, Fretwork, &c., &c.
,, 45.—Coopers' work in all its branches, Casks, Kegs, Vats, Churns, Buckets, &c., &c.
,, 46.—Carriages, Carts, Wagons, Trucks, Barrows, and Vehicles of all kinds.
,, 47.—Wheelwrights' work and separate parts of Carriages, such as Wheels, Spokes, Naves, &c., &c.

CLASSES 42, 43, 44.

REPORT ON FURNITURE, CABINETWARE AND UPHOLSTERY OF EVERY DESCRIPTION.

Jury.

MESSRS. WM. ARMSTRONG, B. SUTCLIFF, JOSEPH SWALLOW, JOSEPHUS WINTER.

D. Isaacs & Co., Cape Town.—The beautiful Beaconsfield bed-room suite of yellow-wood. Of good, superior workmanship, and beautifully hand-decorated.

The Upington bed-room suite of yellow-wood, inlaid with stink-wood. A striking specimen of Colonial workmanship, which will compare favourably with the best imported. The style and quality throughout cannot be excelled.

Dining-room suite (without table and sideboard). Workmanship good, upholstering good.

Drawing-room suite of yellow-wood and essen-wood, ebonized and gilt. Remarkably good. The ebonizing is of a very high class.

Arm-chairs of stink-wood and yellow-wood. Good, neat and substantial. The upholstering of this exhibit is worthy of special mention and deserving of a *silver medal*, which is recommended.

A gold medal is recommended to Messrs. D. Isaacs & Co. for their general display of very excellent furniture, Colonial-made.

Jas. Brister & Co., Port Elizabeth.—Dining-room suite of stink wood, of sideboard, table, couch, two arm-chairs and six chairs. All well-selected matchwood, very substantial and excellent workmanship. A *gold medal* is recommended.

Pianos in Colonial wood, manufactured by Messrs. Brinsmead & Sons, out of the Colony, and are worthy of honourable mention, as showing the beautiful Colonial stink wood to be most suitable for pianos and furniture in general. The workmanship of this exhibit is of the highest order. A *silver medal* is recommended.

Graham's Town Kafir Training Institution.—Sideboard of stink-wood, beautifully made and finished by the trainer of the institution, exhibiting skilled workmanship. A *silver medal* is recommended. A large and varied assortment of bed-room furniture of the best native workmanship, and equal to European. A *silver medal* is recommended.

Lovedale Missionary Institution.—A creditable and lovely display of fairly well made and finished articles of native workmanship in Classes 42, 43 and 44. A *silver medal* is recommended. A *bronze medal* is recommended for the skill exhibited in turning.

A bronze medal is recommended to Mrs. Stewart for a model of the Lovedale Insitution.

St. Luke's Industrial School.—School and church furniture and fretwork. A fair specimen of carpentering, highly commended as being native workmanship. A *bronze medal* is recommended.

Mr. Raubenheimer, of Schoorberg.—A chest of drawers of blue gum, very creditably worked up and finished off. A *bronze medal* is recommended.

Mr. Glennie, of King William's Town.—Folding chairs and seats of Colonial plum, pear and iron woods, and equal to any imported article. A *bronze medal* is recommended.

Mr. O. J. R Moodie, of Knysna.—Work-box of various woods and inlaid table, also Pembroke table, solid and good. A *bronze medal* is recommended

Mr. S. Levy, of Port Elizabeth, exhibits a useful and well-made combination suite for bachelor's bed-room, which is very highly commended Honourable mention.

Mr. C. Keith, of Port Elizabeth.—A rack containing walking sticks, very excellent. A *bronze medal.*

Mr. John Mance, of Port Elizabeth.—A fancy bird cage, excellently made and designed, and creditable to an amateur. Honourable mention.

Mr. H. Rademeyer, of Paarl.—Water vaatje and churn. Good, solid workmanship, but no competition in this Class 45. A *bronze medal.*

Mr. W. G. Patrick.—A very highly finished and elegant example of some carpenter's workmanship in mantelpiece, skirting, architrave moulding, and window and door of yellow-wood and red else. A *silver medal.*

Messrs. Small and Morgan.—A substantial and elegant conservatory. A *bronze medal.*

Articles manufactured of Colonial wood are very excellent; great taste has been displayed in selecting from ornamental and durable Colonial woods. The workmanship and finish are thoroughly good, and stand prominently forward as an encouraging sign for Colonial construction.

AWARDS FOR FURNITURE, &c.

D. Isaacs & Co.—*Gold medal* for general display of Colonial-made furniture. *Silver medal* for upholstery.

Brister & Co.—*Gold medal* for dining-room suite. *Silver medal* for pianos made of Colonial wood.

Graham's Town Kafir Training Institution.—*Silver medal* for side-boards of stink wood, made by the trainer of the Institution. *Silver medal* for assortment of bedroom furniture of native workmanship.

Lovedale.—*Silver medal* for display of articles of native workmanship. *Bronze medal* for skill exhibited in turning.

Mrs. Stewart.—*Bronze medal* for model of the Lovedale Institution.

St. Luke's Industrial School.—*Bronze medal* for church furniture and fretwork. Native workmanship.

[illegible]

SECTION VI.—METAL MANUFACTURES.

[illegible]

CLASS 43.

[illegible] OF ALL KINDS. GAL-[illegible] CASTINGS IN DIFFERENT METALS, [illegible] MANUFACTURED OF BRASS, COPPER, TIN, LEAD, &c.

Jury.

Messrs. R. Thompson, R. Edwards.

In this important class there are several excellent exhibits, which are worthy of special note, as being equal to the best imported articles. We notice first

The large wrought iron gates shown by *Mr. Joseph Lewis*, of the Vulcan Iron Works, Port Elizabeth. These gates display great artistic

skill, and are worthy of the highest commendation. We award the *gold medal* to Mr. Lewis for his admirable exhibit.

Messrs. Howard, Farrar & Co. exhibit a large variety of castings and wrought iron work, all made in Port Elizabeth. Their display is the largest in this class, and reflects the utmost credit on the exhibitors Some of the work is of a superior description, and, we believe, has not been attempted in the Colony before. For their collection of castings we award a *silver medal*, and recommend that special mention be made of the great variety of other articles which they show in this class.

Messrs. Mangold Brothers, Phœnix Works, Port Elizabeth, exhibit some castings of a very superior class, all of which have been made in Port Elizabeth. Great praise is due to this firm for the splendid finish of their work, which compares very favourably with the best imported. For their castings we award a *silver medal*.

From the Railway Works, Uitenhage, there is a splendid piece of forging exhibited, to show the class of work which can be done, while using Colonial coal. This is an admirable example, and is deserving of the highest commendation.

The Lovedale Native Institution also displays some exhibits in forging, which reflect the highest credit on the Principals and workmen connected with this Institution, and we recommend that a *bronze medal* be awarded.

Messrs. W. & E. Alcock show a great variety of tinware articles, all made at their works, Port Elizabeth. The utility and general finish is very superior, and we recommend that a *silver medal* be awarded.

Mr. Whyte, Cape Town, also exhibits a very useful collection of tinware goods which, for appearance and general finish, are worthy of commendation, and we recommend that a *bronze medal* be awarded for the same.

Peter Hamer, Port Elizabeth, exhibits a highly ingenious and useful model of plumber's work and lead windows. The idea has the merit of simplicity and economy, and will, no doubt, secure extended patronage. For this we award a *bronze medal*.

Messrs. Savage & Hill, Port Elizabeth, exhibit a variety of galvanized iron piping, gutters, bins, buckets, &c., made by the Wolverhampton Corrugated Iron Company. The strength and utility of these exhibits are very noticeable, and we recommend a *bronze medal* be awarded.

SECTION VII.—MINERAL AND STONE MANUFACTURES.

CLASS 50.—Bricks, Tiles, Pipes, Flower Pots, Chimney Pots, Water Coolers, Terra Cotta Ware, etc.

" 51.—Stones dressed for building purposes, Plain and Ornamental Plaster Castings, Hydraulic Lime, Lime, Cement, &c.

" 52.—Tombstones and Monumental Work.

" 53.—Pottery made in the Colony or from Colonial Clays.

" 54.—Glassware of all kinds, Pressed, Moulded, Blown, Engraved, &c.

CLASSES 50, 51, 52, 53, 54.

REPORT ON TEXTILE MANUFACTURES, BUILDING STONE LIME, CEMENT, GLASSWARE.

Jury.

MESSRS. JOSEPH ARMSTRONG, P. FLETCHER, ALFRED BULLEN.

Class 50.—Bricks, Tiles, Pipes, Flower Pots, &c.

For general exhibits, we are of opinion that those of *J. P. Lucas, of Graham's Town*, are the best in this class, and award him the *silver medal* for excellence and variety of exhibits.

Bronze medal also to J. P Lucas for special exhibits of fire clay goods, such as flooring tiles, stove tiles, and drainage goods. We are of opinion that the different clays exhibited by this gentleman are capable of producing (with proper manipulation) a very high class article in the above branches.

A bronze medal to Joseph Arrow, of Port Elizabeth, for excellence in the manufacture of Terra Cotta goods, such as flower pots and vases, &c., for garden purposes.

Bronze medal to Joseph Arrow for best bricks suitable for building purposes. We should like to see better bricks produced than any of those exhibited. Most of the exhibits are very faulty in texture and sound, being full of stones and other matter, which might be ground or abstracted in manipulation of the clay before moulding.

Class 51.—Stones dressed for Building Purposes, &c.

Bronze medal to E. W. Gough, Port Elizabeth, for his exhibits in building stones from the Coega quarries.

Bronze medal to Mr. Chas. Worker, of Port Elizabeth, for his exhibits in Plaster of Paris, Fibrous Plaster, &c.; not that the work itself is deserving any special recognition, but that such efforts to show what can be produced should be encouraged.

Class 52.—Tombstones and Monumental Work.

Silver medal to E. W Gough, Port Elizabeth, for excellence in stone and marble work. We would like to remark here that Mr. Gough does not claim to be an inventor of lettering in leads, as stated by some newspapers. This method of lettering with lead has been in use for many years.

Class 53.—Pottery made in the Colony or from Colonial Clays.

Bronze medal to Mr. P. W. Court for Terra Cotta goods made in England from Colonial clay.

Class 54.—Glassware of all kinds, Pressed and Engraved, &c.

No exhibits.

In closing, we wish to remark that with care in the selection of proper material, and the amount of skilled labour at our disposal, as shown in the production of the exhibits we have carefully examined, we are of opinion that none of the articles enumerated in the various classes under our examination need be imported.

SECTION VIII.—FANCY GOODS.

CLASS 55.—Christmas, New Year and Birthday Cards, Fancy Articles (such as those made of Sea Weed, Silver Leaves, Everlastings, Shells), South African Curios, Collections of Shells, &c., &c.

UNCLASSED EXHIBITS.

MISCELLANEOUS ARTICLES NOT DULY CLASSIFIED, EXAMINED AND REPORTED ON BY THE MANUFACTURES COMMITTEE.

Canary Seed (Colonial grown).—A very superior sample by — *Griffiths. Bronze medal*

Sheep Shears made in England by *Messrs. Burgon & Ball.* The superior finish and make of this very useful exhibit entitle it to the highest commendation and *silver medal.*

Bicycle made at Cape Town by Donald Menzies. This machine does not equal the high class imported articles, but is well worthy of honourable mention.

Straw Hats.—There are a number of exhibits of Colonial make. They are, however, roughly finished, and cannot be considered merchantable at prices quoted. Under proper management a considerable industry might be opened up in this trade. A *bronze medal* is awarded for the exhibits of *Mrs. Gradwell* and *A. Goldswain*, they being the best.

Collection of Alum, Salts, Coal, Berry Wax, Candles and Fibrous Plants by C. Barber, C C. & R M., Alexandria. These constitute a very instructive and interesting exhibit, and a *bronze medal* is awarded to *Mr. Barber* for same.

The Genadendal Native Institution exhibits are highly creditable and useful, especially when the age of the children who make the same is taken into consideration. The articles of furniture are well and neatly finished, and the prices quoted exceedingly moderate. For these a *bronze medal* is awarded.

The Knitted and Needlework form a very useful and creditable exhibit, and a *bronze medal* is awarded. The other articles of fancy and plaited work are very neatly got up, and are awarded honourable mention. In connection with this Institution's exhibits, it is noticeable that the work has been done by young children, and reflects high credit on the principals of various classes.

Honourable mention is awarded to — Lovemore and — Killian for their exhibits of Carved Woodwork.

Drum—This being entirely Colonial manufacture is worthy of encouragement, as suggesting a new industry. Honourable mention is awarded to Mr. Marais.

Wood Graining and Panel Decorations.—The exhibit by *A. W. Sawkins, Rondebosch*, shows very excellent work, which is highly creditable to the exhibitor. A *silver medal* is awarded.

Honourable Mention awarded to J. Currie for his exhibits of Horse Shoes.

Honourable Mention to the Bedford Committee for a Chess Board made from Colonial woods by a sailor.

Honourable Mention to Fort Peddie Native Institution for Knitting and Needlework exhibits.

Honourable Mention to Savage & Hill for Pipes made from Colonial wood.

Bronze Medal to W. & C. Burns, Graham's Town, for exhibit of Carved and Ornamental Stone work

Bronze Medal to Savage & Hill for their highly-finished exhibit of articles made from crocidolite.

Bronze Medal to Savage & Hill for their excellent exhibit of Ivory Goods made in England from Colonial produce.

Bronze Medal to Savage & Hill for their exhibit of Jewellery made from South African gold.

Silver Medal is awarded to J. F. Hutcheson, Natal, for Work-box made from South African wood. This beautifully-finished article is considered the best exhibit of the kind in the Exhibition, and must have cost Mr. Hutcheson a very great amount of trouble to collect the various woods used in its construction.

COLONIAL-MADE LUCIFER MATCHES.

The Manufactures Committee have very carefully examined the exhibit of Matches, and grant the highest award, viz. :—

Bronze medal to the Port Elizabeth Company for the variety and general merit of their exhibit.

Honourable mention to the King William's Town and *Cape Town* makers.

The Committee had some difficulty in arriving at a decision on the above, but having satisfied themselves that the Cape Town makers had imported the boxes exhibited, and that King William's Town had imported part of theirs, while the Port Elizabeth Company make all of theirs in town, the Committee are of opinion that although the Port Elizabeth Company's exhibits are not so well finished as the others, yet they are entitled to the highest award, being nearest to a Colonial manufacture.

JAS. BRISTER,
Chairman Manufactures Committee.

SECTION IX.—JEWELLERY, DIAMONDS, AND NATURAL PRECIOUS STONES.

CLASS 56.—Jewellery, Gold and Silversmiths' Work.

CLASSES 49 & 56.

REPORT ON ENGRAVING ON WOOD, METAL (SECTION VI.), JEWELLERY, GOLD AND SILVERSMITHS' WORK (SECTION IX.).

Jury.

MESSRS. JOHN GEARD, WILLIAM JONES, S. WASSERBURG, A. ALLENBERG, JOHN FRY.

In Class 49, Section VI., we award a *silver medal to Messrs. A. Fischer & Co.* for the very superior workmanship displayed in their exhibit of

metal engravings, manufactured in Port Elizabeth. These are of a very high order of merit. We also award a *bronze medal to Mr. J. S Wilcox, of Graham's Town*, for engraving on metal and ivory.

Section IX.—We must express our surprise and admiration at the value, variety and richness of the display of jewellery and curiosities, manufactured from South African gold and other Colonial productions, some of which display exquisite taste in pattern and design. We award a *silver medal to Mr. McGill, of Port Elizabeth*, for his varied exhibit of Colonial manufactured jewellery; *a silver medal to Messrs. Joseph & Sons, of Port Elizabeth*, for their exhibit of Colonial manufactured jewellery.

A bronze medal to Mr. Shaw (Paarl) for his exhibits, containing some exquisite designs in silver jewellery of Colonial manufacture; and a *bronze medal to Mr. Wilcox, of Graham's Town*, for his exhibit of gold and silver jewellery We consider *Messrs. A. Fischer & Co.* fully entitled to a *special gold medal* for the best collection of jewellery manufactured in this Colony, from South African gold and South African diamonds.

Our attention was drawn to a clock, manufactured by Messrs. A. Fischer & Co., which requires winding only once a year. The workmanship in this clock, which is entirely of Colonial manufacture, and the case in which it is fixed, made of Colonial wood by Mr. J. Kohler, of this town, are both of them highly creditable to the manufacturers, and, in our opinion, worthy of high commendation.

SECTION X.—MACHINERY.

SUBJECT TO REGULATION No. 12.

Class 57.—Agricultural Machinery suitable to the wants of South Africa. Made both here and abroad.

" 58.—Machinery of all kinds made in South Africa only.

" 59.—Machinery specially adapted to South African wants (such as machines for boring purposes, raising water, diamond cutting and polishing, &c.), wherever made, subject to the approval of the Committee.

" 60.—Tools, utensils and articles using in farming or industrial pursuits.

" 61.—Models of Machinery used in existing Colonial industries, *e.g.* Model of a Sugar Mill.
" Diamond Washing Machine.
" Gold Washing Machine.
" Wool Washing Machine.
Model illustrating Wine Making.
" " Distillation.
" " Cotton and Silk Manufacturing.
" " Candle and Soap Manufacturing.
" of any other South African Industry, &c.

[illegible]

[illegible]

[illegible]

[illegible]

Mr. Simey shows a well-made steam pump called "Valiant." This, in our opinion, is well suited for fire purposes and for village water supply, and, under certain circumstances, for irrigation also. It would be most suitable where clean water has to be pumped. We highly commend this "steam pump" as a compact, powerful and well-made machine.

CLASS 60.

REPORT ON TOOLS, UTENSILS AND ARTICLES USED IN FARMING OR IN INDUSTRIAL PURSUITS.

Jury.

(Published under the authority of the Executive Committee.)

In this class Mr. T. J. Simey exhibits a very useful assortment of spades, shovels, forks and a general variety of tools made by Messrs. A. Norris & Sons, Stourbridge. The whole of these goods are highly finished, and appear well adapted to the requirements of Colonial trade. *Silver medal.* Mr. Simey also exhibits samples of Mr. John Shaw's Patent Lock-wedge Fencing. This is well made, and, considering its strength and simplicity of construction, should meet with general approval. *Bronze medal.*

Messrs. Parker & Co., Port Elizabeth, show a varied assortment of agricultural implements and tools such as they regularly import for this market. For the general finish and suitability of their exhibits we recommend that *Messrs. Parker & Co.* be awarded a *silver medal.*

Messrs. Howard, Farrar & Co. exhibit a very large collection of imported articles used in agricultural and industrial pursuits. Particularly worthy of mention are the different classes of spades, shovels and forks, which appear to be of excellent workmanship. The tools generally are of a serviceable and useful variety. For their collection we award *Messrs Howard, Farrar & Co. a bronze medal.*

The Lovedale Native Institution exhibit a very creditable display of tools and other articles used in farming and industrial operations. These are of Colonial make, and particularly suited to South African wants. The officers of this admirable Institution are to be congratulated on the success which has attended their efforts to produce such articles as are in general use, finished in a substantial manner at a moderate price. For the general merit of this collection, and in consideration of its being entirely of Colonial manufacture, we recommend a *silver medal.*

The Lovedale Native Institution show some well finished wheels and wheelbarrows, made from Colonial wood. This exhibit is a very useful one, and we recommend that a *bronze medal* be awarded.

Messrs. Silber & Fleming exhibited a very complete and valuable collection of dairy utensils, which attract great attention from the farmers, and for which we recommend a *silver medal.*

CLASS 61.

REPORT ON MODELS OF MACHINERY USED IN EXISTING COLONIAL INDUSTRIES.

Jury.

MESSRS. J. STRATFORD, W. S. WEBBER, W. BURLS.

The fine display of models from Kimberley will be reported on by a special Committee.

A model woolwashing plant, made at the Uitenhage Railway Workshops, is worthy of notice. It consists of a soaking tank, washing and rinsing machine, made in a thoroughly good and workmanlike manner; but this was not entered for competition. *Messrs Howard, Farrar & Co.* exhibit a good collection of models, notably a model turbine water wheel for driving all classes of machinery, pumps, &c, which has been tested in actual work. It is strongly made, and being to scale, all the parts are easily understood. They also show a beautifully finished model centrifugal pump, with pipes, &c., complete. Models of Howard's various ploughs and harrows, &c. Reaping machines are shown by the same firm, all made to scale, and well got up. We consider this collection entitled to a *bronze medal.*

The "Germania" windmill and pump are faithfully represented by a highly-finished model, which was evidently of great service to the makers of the mill (*Messrs. Mangold Bros*), for explaining the principle of their manufacture. With it they also show the patterns from which the castings of this model mill were made. We are of opinion this model is of sufficient merit to warrant the bestowal of a *bronze medal.* Several small models of windmills are shown in the wool department, but do not call for special notice.

Very fine models of steamers are shown by the Union Steamship Company and Messrs. Donald Currie & Co., but as these do not come under the head of models of machinery used in South African industries, we have not considered it our province to make any award.

The same remarks apply to seven exhibits of ships and boats.

NATAL AND KIMBERLEY COURTS.

SPECIAL REPORT.

The following special report is issued by authority of the Executive Committee:—

NATAL COURT

The several exhibits in the Natal Court have been duly judged by the jurors of the different departments, but a general reference is due to it, independent of the awards to individual exhibitors.

It was the centre of considerable interest and attraction, owing to the variety of its natural products and its collection of manufactured articles fit for daily use.

Coffee, tea, sugar, biscuits, preserves, condiments, arrowroot, and confectionery of excellent quality were shown, giving proof of the energy and enterprise of our brother colonists, as well as the adaptability of Natal soil for producing valuable products in great variety. It is very satisfactory to find that these goods are of South African growth and manufacture, and a matter for regret that our fiscal arrangements should form an obstacle to greater consumption of these articles in this Colony.

Among the products were tobacco and fibre, which attracted much attention, and also Natal earth for making paints. This latter industry of converting these Colonial earths into paints, stainings for wood, &c., is making way, not only in Natal, but in this Colony, several exhibits of the same character having been sent from King William's Town.

Natal coal figured also among its natural products, besides some rich specimens of gold quartz taken from the recently discovered reefs bordering on Swaziland.

KIMBERLEY COURT.

The Kimberley Court may be said to have been one of the principal features of the Exhibition, the display of diamonds and other minerals affording thousands of visitors their only opportunity of viewing these precious stones in quantity.

The chief exhibit of rough diamonds was made by the French Diamond Mining Company, who exhibited in turn two weeks' washing, each amounting to 4,000 carats, and comprising a total value of £10,000. Rough diamonds were also exhibited by Government, consisting of diamonds seized by the Detective Department, Kimberley, value over £3,000; also by the De Beer's Company a parcel of picked stones, which on account of their purity were much admired. A small parcel of diamonds, the result of working in the Newlands mine, also attracted attention, as showing the large area over which diamonds are found in Griqualand West, this mine being fifty miles from Kimberley.

Numerous specimens of diamonds in the so-called matrix or blue ground, showing the different varieties of such ground, were contributed by the French, the De Beer's United, and Phœnix Diamond Mining Companies.

And to add to the interest of the collections, maps showing the geological sections of the four mines had been prepared to a scale, and specimens of the various formations, both of the mines and rocks surrounding them, were exhibited. A set of these plans and of the geological specimens have been presented to the town, and will form an important item towards the foundation of a permanent industrial museum in this town.

Mr. James Hill, M.L.A., showed a large collection of specimens from the River diggings in the district of Barkly, including various diamondiferous gravels.

Further, to explain the practical working of the mines and the means of extricating these precious stones from the soil, working models, most perfectly executed, made to scale, were on view. These models were very interesting, as showing the gradual progress from the primitive methods adopted in the early history of diamond mining, before the depth of the mine rendered necessary the ingenious and perfect means now adopted for raising the diamondiferous soil. They comprise:—

1. A model showing a sectional block of the Kimberley Mine in 1873, with about a hundred separate hauling gears, each supposed to

be worked by four natives, the average daily output from each gear being 7 to 10 cart loads of 16 cubic feet each. The greatest depth of the mine was about 100 feet, the scale being 1 inch to 4 feet.

2. A model of a horse whim used in 1874, when the mines were 200 feet deep, for hauling ground from the mine, and landing 40 to 50 cart loads per diem. Several hundreds of these were used in the different mines till 1877, after which they were gradually replaced by steam engines, the working of which was shown by the next model.

3. A section of the claims of the Griqualand West Diamond Mining Company, making an excellent comparison with the foregoing, showing the hauling gear at present in use, which, with the application of steam, is capable of hauling 6 to 800 loads per day.

In addition to these were models showing the means by which the diamonds were extracted from the soil.

4. A model which replaced the dry sorting process in 1874, and was followed by rotary machines in 1875, but these have been superseded by a most perfect machine, shown by

5. A model of complete washing gear. This being attached to the steam engine in the machinery annexe, was frequently set in motion, and much interest was shown by visitors in watching the complicated process by which the diamonds were separated from the soil, and the ingenuity with which water was economized and made to do duty several times.

6. A model with an improved gravitation washing machine, designed by Mr. Blackbeard, managing director of the Griqualand West Diamond Mining Company, closes this most interesting and instructive exhibition of models.

We are not called upon to express an opinion on the relative value of the different models, and we do not go beyond recording the appreciation which was evinced by thousands of spectators of the skilfully constructed models, which in motion conveyed such a very good idea of the reality. Among the crystals shown in this exhibit were a number of curious formation, which indicated in various stages the mode in which crocidolite was formed. These, together with crocidolite from various other exhibitors, were arranged in a case, and formed a most complete show of this interesting mineral.

A report on the Kimberley exhibits would not be complete without a reference to the photographs, which showed the mines at different stages of their history, and the various lithographs, which served to instruct visitors in regard to the progress and condition of this wonderful centre. There were also numerous natural curiosities and some interesting Bushman carvings.

In conclusion, it is only due to the Kimberley Committee to congratulate them on the success of their efforts in contributing an exhibition so perfect in all its details, and so unique and valuable as would render it an object of the greatest curiosity and interest in any part of the world. The thanks of the Executive Committee are due to the Kimberley Committee and all who so ably assisted them to bring about this successful result, and also to Mr. John Fry, who was in charge of the exhibit, and whose obliging attention and untiring explanations and descriptions to visitors gave increased value to the exhibit.

The Committee are much indebted to the Standard Bank for their exhibit of gold and gold-bearing quartz received from their branch at Pretoria. The exhibit of South African minerals would have been incomplete without this specimen of its products. With this and samples of gold-bearing quartz from the Chamber of Commerce and

others, a very interesting and valuable exhibit was made up. The thanks of the Committee are also due to those gentlemen who so kindly lent collections of natural curiosities for the purpose of decorating the archways in the main building. Among them are Mr. John Anderson, for heads, horns and skins of wild animals, native mantles assegais, &c.; Mr. Bartholomew, of Peddie, for a large collection of Kafir curios in bead work, pipes, and various other native implements; Mr. John Fry for a collection of heads, horns, and assegais from the far interior; the Committee of the Colonial and Indian Exhibition for a collection of heads, horns and karosses, &c. Among those who contributed in a lesser degree were Messrs. Baker & Bowes, Mr. Hocking, Mr. Chalmers, Mr. W. Armstrong, and the Hon. J. X. Merriman. A very large and interesting collection of Kafir implements and curios was sent by Mr. Snooke, of St. Marks. They arrived late and were placed in the feather room, where they attracted considerable attention.

JOSEPH WALKER.
WILLIAM HUME.

UNCLASSED MACHINES.

REPORT (A) ON FIRE ARMS.

Jury.

MESSRS. GEO. GORDON, D'URBAN DYASON, WM. ARMSTRONG.

1. GUNS (A).

In submitting this report we beg to express our regret that there is no competition under this head, *Mr. John Grainger*, of Port Elizabeth, being the only exhibitor; but the excellence of, and we believe the latest improvements in, the rifles examined by us are such that we strongly urge the Committee to award Mr. John Grainger a *gold medal* for the two rifles manufactured in the Colony.

1st.—"The Grainger" single rifle, patented 15th July, 1884, No 10,188. Falling block with lock and trigger action, jointed to the falling block, which rises and falls by a side lever action, the ejector receiving great force from the lever.

The entire gun is manufactured in the Colony, the mechanism is simple and works freely, has a neat stink-wood stock, and the finish throughout is very superior. We think it worthy of mention that we were shown a sketch of and method of working a double rifle for long range (with the barrels one over the other), which is now being manufactured in England, subject to Royalty on the above "Grainger Patent," which we trust will become the military weapon of the future.

2nd.—"The Grainger Target Rifle," Falling Block, with under lever. The block-action is of the highest order; swivel main spring and tumbler, with rebounding action. The ejector is very powerful, with direct action from the main lever. The gun is entirely Colonial made: has patent Grainger Rifling. The finish is excellent, with improved sights.

We believe this is a very high-class Match Rifle. Mr. John Grainger also exhibits a very ingenious and simply constructed Model Engine in brass, made by himself, for pumping and driving combined. The mechanism appears to work smoothly, and the machine would, no doubt, be very useful for the farming community.

REPORT ON (B) TOBACCO CUTTER.

Jury.

MESSRS. RICHARD POWELL, J. MANGOLD.

TOBACCO CUTTER.

We desire to call attention to a Tobacco Cutter, made by *Mr. Arthur Heatlie, of Hex River, Worcester.* This little machine occupies a very small space, and with some alteration, which can be easily made, would become a very useful article to those dealers who require to cut up small quantities of tobacco daily.

Its specialty is to cut "roll" or Boer tobacco, which is inserted in two perforations on one side of the box, about 16 inches by 6 inches, and brought by means of rollers to the other side, where two knives are placed, and by a novel application of their movement, the tobacco is turned out, cut and ready for use. A boy of 10 years old is capable, without previous knowledge, of working this machine. In consideration of the ingenuity displayed in constructing this little machine, its Colonial make, and its probable utility to the general public, we would recommend, as a special mark of consideration, a *bronze medal.*

REPORT ON SEWING MACHINES.

Jury.

MESSRS. J. MANGOLD AND H. T. ROULSTON.

We have gone carefully through the above class, and now report as under :—

For Tailoring.—Bradbury & Co. (Ivy Bros., Agents). We recommend on account of improved Shuttle and Treadle, and consider it a very useful machine.

For Shoemaking.—Singer's Machine Company. Strongly recommend for strength and finish.

For General Domestic Purposes.—Singer's Light Machine for hand and treadle. We consider this machine very good, and very strongly recommend it.

For Dressmaking.—Jones & Co.'s Machines (Brigg Bros., Agents). The Medium and Hand Machines are very good

General Remarks.—Singer's Machine Company exhibit a case of their machines in parts. We consider them well-finished. For all practical purposes we consider the Singer's Machine Company is the best of any other exhibits ; but for appearance we consider Jones' machines are very good. The reason for recommending the

Bradbury's No. 4 Machine is that the shuttle is larger and more conveniently placed than any other oscillating shuttle.

Bronze Medal to Messrs. Ivy Bros. for tailoring machine, made by Messrs. Bradbury.

Bronze Medal to Singer's Machine Company for shoemaking machine; also

Honourable Mention to the Singer's Machine Company for the general finish and superiority of their exhibits.

Honourable Mention to Messrs. Briggs Bros. for their exhibit of Sewing Machines made by Messrs Jones.

GROUP C.—NATURAL HISTORY AND SCIENCE.

SECTION I.—ZOOLOGY.

CLASS 62.—Collections of stuffed specimens of Indigenous Wild Animals, scientifically named, classified.
„ 63.—Ditto of Birds.
„ 64.— „ Fish.
„ 65.— „ Insects and Reptiles.

SECTION II.—BOTANY.
SECTION III.—GEOLOGY.
SECTION IV.—MINERALOGY.
SECTION V.—CONCHOLOGY.

CLASSES 62, 63, 64, 65.

REPORT ON COLLECTIONS OF INDIGENOUS ANIMALS, BIRDS, FISH, INSECTS AND REPTILES.

Jury.

MESSRS. WILLIAM ALCOCK, SLOMAN ROUS, F.L.S., J. M. LESLIE.

We beg to submit our report on Natural History, and regret that we had not the pleasure of inspecting larger collections in the five sections under Group C.

In Class 62 there are no exhibits.

In Class 63 we award Honourable Mention to Mr. W. Hare for his collection of Colonial Birds, skinned and preserved in a very creditable manner, but unfortunately they are not scientifically named or classified. We observed that each specimen was neatly labelled with its correct common or popular name.

In Class 64 there are no exhibits.

In Class 65 we award Honourable Mention to Mr. Billinghurst for his collection of Colonial Insects, especially the Butterflies, which are

scientifically named and classified, neatly mounted and well displayed. We regret that the largest case containing a varied assortment of natural orders of insects was not classified.

We also recommend Honourable Mention to Mr. Lagerwall for his display of Curiosities, Heads, Horns and Skins of Animals, Reptile Skins, Stuffed Birds, and a few Foreign Insects. These exhibits are not scientifically named or classified.

Mr. S. D. Bairstow's small exhibit of four cases of Insects Injurious to our Food Crops, Fruit and Forest Trees is scientifically named and classified, which we hope is intended to form a basis of a Colonial Literature on such an important subject of vital interest to this country. In these cases, alongside the Insect (pest), is given a diagram or etching of itself, with common and scientific name and popular description of its form, domestic economy and method of ravages. Then follow suggestions for remedial measures for saving our crops and animals from destruction by these pests.

We beg to draw the attention of the Committee to this exhibit as a nucleus of an important scientific work, which we hope will be the means of instructing our Agricultural and Horticultural Farmers in the life and general economy of Insect Pests, which play such havoc wherever they locate themselves. With the view of stimulating researches upon such an important work we beg to recommend that a *special prize of a silver medal* be awarded to him for his scientific work upon Injurious Insects of South Africa.

GROUP D.—FINE ARTS.

SECTION I.—PAINTING, DRAWING AND SKETCHING.

CLASS 66.—Paintings in Oils of all kinds.
„ 67.—Water Colour Drawings.
„ 68.—Architectural and Mechanical Drawings and Models.
„ 69.—Lithographs, Chromes, Photographs, Decorative Work, Tracings on Wood, Ivory, &c. Plaster and Clay Models. Paints on Panels, Vases and Plaques.

CLASSES 66, 67, 68, 69.

REPORT ON PAINTINGS IN OILS OF ALL KINDS, WATER COLOUR DRAWINGS, ARCHITECTURAL AND MECHANICAL DRAWINGS AND MODELS, PHOTOGRAPHS.

Jury.

MESSRS. OSCAR BRACHT, E. SCHNITZLER, R. H. HAMMERSLEY-HEENAN.

FINE ARTS.

Class 66.—Paintings in Oils of all kinds.

Silver medal to No. 14, Knysna Heads, *A. de Smidt.*

Honourable mention to the following :—

No. 23.—Cape Flats, by Mrs. H. Fletcher.
No. 41.—Blarney Castle, by Mrs. H. Fletcher.
No. 44 —Wynberg Hill, by Mrs. H. Fletcher.
No. 31.—Flowers, by Miss Margaret White.
No. 39.—Peaches, by James Ford.
No. 12.—Wild Flowers, by Mrs. H. Fletcher.
No. 48.—Grapes and Tomatoes, by James Ford.
No. 56.—Grapes, by James Ford.
No. 121.—Protea, by Miss Margaret White. Also for Flowers on panels by Miss Dyason and Miss Kirkwood.

Water Colours—Class 67.

Silver medal to Miss Thwaits for her collection of Fish and Flowers, and we further consider this collection should be sent Home to the Colonial and Indian Exhibition, 1886. We recommend a *special silver medal* for the collection of Sketches No. 438, by *Mrs. Allen, Natal.*

Honourable mention to the following :—

No. 102.—The Valley, by H. C. Leslie, Port Elizabeth.
No. 169.—River Mouth, by W. Fleming, Mossel Bay.
No. 149.—Views on the Umzimkulu, by Mrs. Allen.
No. 437.—Water Colour Drawings, by Major Granville.

Architectural Drawings Class 68.

Silver Medal to Arthur H. Reid, Port Elizabeth, for the best finished collection of Architectural Drawings

Honourable mention to Sydney Stent, Kimberley, for his collection.

Mechanical Drawings.

Bronze Medal to Howard, Farrar & Co., Port Elizabeth, for best collection of Mechanical Drawings.

Outline or Shade Drawings

Bronze medal to No. 236, *T. Ninham, Cape Town.*

Sketches from Nature.

Bronze medal to No. 300, *W. Burnett Stocks.* To the following works of the various Schools of Art we award honourable mention :—C. D. Williams, 274 ; J. R. Koller, 224 ; J. Gray, 256 ; Norman Porter, 313 ; Mary White, 317 ; W. B. Stocks, 327 ; D. H. Souter, :31 ; Nos. 341 to 344 (both inclusive) ; and for good copies in Water Colours to Miss J. Burnett, 348 , Miss Milton, 350 , Miss F. McGill, 352 ; ——, 345. Also to Miss Maude Edwards for sketches of Flowers in oils.

Photography.

A silver medal to Mr. Harris for the largest and best collections.
A silver medal to Mr. B. Kisch for the best collection of portraits.
Do., do. do. for enlargements.
A silver medal to Mr. Harris, for the best set of instantaneous photographs.
A silver medal to Mr. Foe for the best collection of landscapes.

Honourable mention to Mr. Battenhausen for his collection of portraits and enlargements.

For works not included in above classes :—

Honourable mention to Nos. 209, 209*a*, 210, by Andrade ; also for specimens of addresses, by Neuwerth.

SECTION II.—LITERATURE.

CLASS 70.—Essays and Papers.
„ 71.—Collection of Works upon South Africa.

CLASS 70.

Jury.

MESSRS. WM. HUME, JOSEPH WALKER, WM. SAVAGE.

[In this class there is no Special Report. The Essays and Papers selected by the Jury appointed to consider such as were submitted, appear with the Lectures which were delivered in connection with the Exhibition.—*Editor.*]

APPENDIX VIII.

LIST OF MEDALS AWARDED.

BRONZE MEDALS.

No.	Recipient.	For What.	Residence.
1	J. Roth	Fibres	Uitenhage.
2	Fleming & Mudie ...	Cape Aloes	Mossel Bay.
3	H. L. Spindler	Berry Wax	Port Elizabeth.
4	H. F. P. Zinn	Berry Wax	Humansdorp.
5	D. L. Parent	Buchu	Cape Town.
6	D. L. Parent	Medicinal Herbs ...	Cape Town.
7	McMaster & Ryland ...	Wheat	London.
8	E. W. Holdstock ...	Raw Silk	Chalumna.
9	Geo. King & Sons ...	Raw Silk	Bedford.
10	J. J. Edwards	Raw Silk	Baviaans River.
11	A. E. Thomas	Raw Silk	
12	Lovedale Native Inst....	Underclothing ...	Alice.
13	Holy Rosary Convent ...	Fancy and Embroidery Work ...	Port El'zabeth.
14	Mrs. Bevan	Fancy Work ...	Uitenhage.
15	Miss Sherman	Fancy Work ...	Port Elizabeth.
16	Miss Jessie Moorcroft ...	Lace	Wodehouse.
17	Miss K. Symons ...	Embroidery... ...	
18	Miss Penelope Considine	Wax Flowers ...	Port Elizabeth.
19	Mrs. Saunders	Honiton Lace ...	Port Elizabeth.
20	Savage & Hill	Dress Fabrics ...	
21	James Crawford ...	Shawls	Glasgow.
22	Hastings & Hildred ...	Clothing	London.
23	Thos. Townend & Co. ...	Hats	London.
[illegible]	Joshua Ellis & Co. ...	Tweeds, &c.... ...	Dewsbury.
25	John Hall	Mohair Manufactures	Port Elizabeth.
26	W. Lane	Dressed Skins ...	Port Elizabeth.
27	P. Titherington... ...	Dressed Skins ...	Port Elizabeth.
28	"City Saddlery Works"	Colonial Saddlery ...	Cape Town.
29	J. P. Cupido	Leather and Harness	Paarl.
30	John Garlick	Boots and Shoes ...	Cape Town.
31	H. J. Smith	Dressed Feathers ...	Port Elizabeth.
32	G. H. Dumbleton ...	Oatmeal	Knysna.
33	Christopher Rigg ...	Honey	Port Elizabeth.
34	P. W. Marais	Dried Fruits ...	Robertson.
35	Kelly & Co.	Preserved Fruits ...	Port Elizabeth.
36	Mrs. W. J. Edwards ...	Preserved Fruits ...	Graaff-Reinet.
37	Jameson & Co.	Sauces, &c.	Durban, Natal.
38	Alfred Brookes	"Hotch Potch" (Fruit Chutney)	Port Elizabeth
39	W. C. Jones & Co., ...	Confectionery ...	King Wm.'s Tn.
40	H. C. Collison	Ginger Brandy ...	Cape Town.
41	J. H. & J. van Ryn ...	Pale Ale	Cape Town.

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] & Son	[illegible]	[illegible]
[illegible]	[illegible] & Co.	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Works	[illegible]	
[illegible]	[illegible]	[illegible]	Port Elizabeth.
[illegible]	[illegible]	[illegible] and Soda	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible] Water, &c.	[illegible]
[illegible]	[illegible]	[illegible] &c.	[illegible]
[illegible]	J. W. [illegible]	[illegible] Medicine Chest, &c.	Port Elizabeth.
[illegible]	[illegible]	Lithography	Port Elizabeth.
[illegible]	[illegible]	Hock	[illegible]
[illegible]	Lovedale Native Inst.	Turning	
[illegible]	[illegible]	Model	Lovedale.
[illegible]	[illegible] School	Furniture ...	East London.
[illegible]	H. [illegible]	Chest of Drawers ...	[illegible]
[illegible]	[illegible]	Rocking Chairs ...	King Wm.'s Tn.
[illegible]	[illegible]	Work Box, &c. ...	[illegible]
66	[illegible]	Bachelor's Furniture	Port Elizabeth.
67	[illegible]	Walking Sticks ...	Port Elizabeth.
[illegible]	H. [illegible]	Water Cask and Churn	Paarl.
69	[illegible] & Morgan ...	Conservatory ...	Port Elizabeth.
70	Irons Brothers ...	Travelling Buggy	Cradocknoorn.
71	A. [illegible] Frank	Travelling Cart ...	Paarl.
72	A. [illegible] Frank	Spider	Paarl.
73	C. Wahl	Travelling Cart ...	Paarl.
74	Howard Farrar & Co....	Iron Castings, &c. ...	Port Elizabeth.
75	Lovedale Native Inst. ...	Iron Forging ...	
76	[illegible]	Tinware	Cape Town.
77	P. Hamer	Plumbers' Work ...	Port Elizabeth.
78	The Wolverhampton Galvanized Corrugated Iron Company ...	Galvanized Iron Piping, Bins, Buckets, &c.	
79	Singer Manufacturing Company	Sewing Machines ...	Port Elizabeth.
80	Bradbury & Co. ...	Sewing Machines ...	London.
81	A. Heatlie	Tobacco Cutter ...	Worcester.
82	J. S. Wilcox	Engraving on Metal and Ivory ...	Graham's Town.
83	J. P. Lucas	Fire Clay Goods ...	Graham's Town.
84	J. Arrow	Terra-Cotta	Port Elizabeth.
85	J. Arrow	Bricks	Port Elizabeth.
86	E. W. Gough	Building Stone ...	Port Elizabeth.
87	C. Werner	Modelling in Plaster of Paris	Port Elizabeth.
88	W. & C. Burns	Stone Work	Graham's Town.
89	P. W. Court	Terra-Cotta	Port Elizabeth.
90	R. W. Shaw	Jewellery	Paarl.
91	J. S. Wilcox	Jewellery	Graham's Town.

No.	Recipient.	For What.	Residence.
92	Howard, Farrar & Co....	Imported Tools, &c.	Port Elizabeth.
93	Lovedale Native Inst. ..	Wheelbarrows, &c....	Lovedale.
94	Howard, Farrar & Co....	Models	Port Elizabeth.
95	Mangold Brothers ...	Model Windmill ...	Port Elizabeth.
96	Howard Farrar & Co. ...	Mechanical Drawings	Port Elizabeth.
97	T. Ninham	Sepia Painting ...	Piquetberg.
98	W. B. Stocks	Painting from Nature	
99	W. Griffiths	Canary Seed ...	Van Staaden's Heights.
100	E. A. Gradwell	Straw Hats	Somerset East.
101	Miss Goldswain... ...	Straw Hats... ...	Peddie.
102	Chas. Barber	Alum, Salt, Berry Wax & Products	Alexandria.
103	Genadendal Native Inst.	Furniture, &c. ...	
104	Genadendal Native Inst.	Knitted Work, &c....	
105	Savage & Hill	Crocidolite Articles	Port Elizabeth.
106	Savage & Hill	Ivory Goods ...	Port Elizabeth.
107	Savage & Hill	Jewellery from S. A. Gold	Port Elizabeth.
108	Lucifer Match Company	Colonial Matches ...	Port Elizabeth Match Factory.
109	M. Little & Sons ...	Sheep Dip	Doncaster, England.

SILVER MEDALS.

1	W. Williams & Co. ...	Colonial Woods ...	Bedford.
2	J. C. Blamey	Fibres	Maritzburg, Natal
3	R. Tillard	Fibres	Graham's Town.
4	Lovedale Native Inst. ...	Plants and Roots ...	
5	C. J. Watermeyer ...	Golden Ball Wheat	Graaff-Reinet.
6	P. Ryan	Wheat	Malmesbury.
7	P. & P. Rabie	Best Barley	Worcester Dist.
8	J. J. Joubert	Best Pearl Barley ...	Worcester Dist.
9	C. Brown	Best Yellow Maize...	King Wm.'s Tn.
10	Carter Brothers... ...	Agricultural Seeds...	London.
11	D. P. Pienaar	Superior Grease Wool	Molteno.
12	R. Rubidge	Karoo Wool ...	Graaff-Reinet.
13	A. Vigne & Co.	Grease Wool ...	Middelburg.
14	S. Moorcroft	Fleecewashed Wool	Dordrecht.
15	C. Robertshaw	Scoured Wool ...	Uitenhage.
16	J. G. D. Rex	Angora Hair ...	Jansenville.
17	A. F. Strauss	Angora Hair ...	Colesberg.
18	G. Pretorius	Angora Hair ...	Bedford Dist.
19	John Priest	Angora Hair ...	Graaff-Reinet.
20	John Priest	Ostrich Feathers ...	Graaff-Reinet.
21	A. C. Pringle	Best Long Black Feathers	Melrose, Bedford District.
22	R. Featherstone ...	Best Long Drab Feathers	Pearston.
23	L. A. Benjamin... ...	Special Medal for Collection of Ostrich Feathers ...	Port Elizabeth.
24	T. H. Copeland	Ladies' Tailoring ...	Graham's Town.

No.	Recipient.	For What.	Residence.
25	Robert Slatem	Best Nets and Hammocks	Port Elizabeth.
26	The Convent of the Sacred Heart	Best Needle and Embroidery Work ...	King Wm.'s Tn.
27	Cook, Son & Wormald...	Blankets from Cape Wool	London.
28	William Harris & Sons	Hosiery from Cape Wool	Leicester.
29	Longworth & Bairstow	Tweeds from Cape Wool	Port Elizabeth.
30	Wm. Jones & Co. ...	Leather Exhibits ...	Port Elizabeth.
31	W. Lane	Best Dressed Cape Skins	Port Elizabeth.
32	G. Eirwood	Best Colonial-made Harness... ...	King Wm.'s Tn.
33	G. Eirwood	Best Colonial-made Saddles	King Wm.'s Tn.
34	Wm. Jones & Co. ...	Best Colonial-made Boots and Shoes	Port Elizabeth.
35	J. J. Joubert	Best Meal and Flour from Western Province Wheat ...	Worcester Dist.
36	George Vice	Best Meal from Eastern Province Wheat	Molteno.
37	Letterstedt & Co. ...	Flour and Meal ...	Cape Town.
38	Dr. Stroud	Hives and Honey ...	Port Elizabeth.
39	Jameson & Co.	Best Preserved Fruit	Durban, Natal.
40	The P. E. Steam Confectionery and Preserve Works... ...	Confectionery ...	
41	J. J. Hill & Co.	Confectionery ...	Cape Town.
42	J. H. & J van Ryn ...	Cape Wines... ...	Cape Town.
43	The Port Elizabeth Wine Association	Cape Wines	
44	E. K. Green & Co. ...	Cape Wines... ...	Cape Town.
45	The Montagu Committee	Unfortified Wines ...	
46	H. C. Collison	Cape Brandy ...	Cape Town.
47	The Port Elizabeth Wine Association	Cape Brandy ...	
48	J. S. Aspeling & Co. ...	Cango Brandy ...	Port Elizabeth.
49	E. K. Green & Co. ...	Cognac Brandy ...	Cape Town.
50	D. Cloete & Co.... ...	Best Bottled and Draught Ale ...	Cape Town.
51	Letterstedt & Co. ...	Bottled Ale	Cape Town.
52	The Paarl Wine & Brandy Company	Benedictine Liqueurs	
53	Cohen & Schmidt ...	Colonial Cigars ...	Cape Town.
54	O. Landsberg & Co. ...	Snuff from Imported Tobacco	Cape Town.
55	J. H. Drury & Co. ...	Snuff from Imported Tobacco	Port Elizabeth.
56	E. Ebert & Co.	Colonial Tobacco ...	Port Elizabeth.
57	E. Ebert & Co.	Pipes from Colonial-grown Wood ...	Port Elizabeth.
58	Hitzeroth Brothers ...	Salt	Uitenhage.

No.	Recipient.	For What.	Residence.
59	Geo. Brown	Soap and Candles ...	Nucleus Works, Port Elizabeth.
60	B. G. Lennon & Co. ...	Best Perfumery, &c.	Port Elizabeth.
61	The Lovedale Native Inst.	Printing and Bookbinding	
62	D. Isaacs & Co	Upholstery	Cape Town.
63	John Brinsmead & Sons	Pianos in Colonial Wood Cases ...	London.
64	The Graham's Tn. Kafir Institute	Stinkwood Sideboard	
65	The Graham's Tn. Kafir Institute	Native-made Furniture	
66	Lovedale Native Inst. ...	Furniture and Carpenters' Work	
67	W. G. Patrick	Carpenters' & Joiners' Work	Port Elizabeth.
68	Deas Brothers	Extension Top Phaeton	Oudtshoorn.
69	Deas Brothers	Four-Seated Spring Travelling Cart...	Oudtshoorn.
70	Quick & Thorogood ...	Best Model Buck Wagon	Port Elizabeth.
71	A. Fischer & Co. ...	Best Metal Engraving	Port Elizabeth.
72	John P. Lucas	Clay and Pottery ...	Graham's Town.
73	E. W. Gough	Stone and Marble Work	Port Elizabeth.
74	B. D. McGill	Colonial-made Jewellery	Port Elizabeth.
75	Joseph & Sons	Colonial-made Jewellery	Port Elizabeth.
76	The American Manufacturing Company	American Fruit Evaporator	Waynesboro, Penn.
77	Mangold Brothers ...	Germania Windmill	Port Elizabeth.
78	A. Norris & Sons ...	Tools used in Farming	Stourbridge.
79	Parker & Co.	Imported Agricultural Implements & Tools	Port Elizabeth.
80	The Lovedale Native Institution	Tools & Implements used in Farming pursuits	
81	Silber & Fleming ...	Dairy Implements ...	London.
82	S. D. Bairstow	Special Medal for Exhibit of Insects injurious to Fruit and other crops...	Port Elizabeth.
[redacted]	A. de Smidt	Painting in Oils, Knysna Heads ...	
84	Miss Thwaits	Water Colour Paintings, Fish and Flowers	Wynberg.
85	Mrs. Allen	Water Colour Sketches, Kafir Heads	Natal.
86	A. H. Reid	Architectural Drawings	Port Elizabeth.
[redacted]	Robert Harris	Best Instantaneous Photographs ...	Port Elizabeth.
88	William Roe	Best Landscape Photographs... ..	Graaff-Reinet.

INDEX.

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CORRECTIONS AND ADDITIONS.

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At p. 1, insert after the title the words—THE PRIZE ESSAY TO WHICH THE GOLD MEDAL AND £10 WERE AWARDED.

„ 73, The Prize Essay to which the Silver Medal was awarded.

„ 185, for "Baron *A.* von Babo" read "Baron *C.* von Babo."

„ 329, The Prize Essay to which £10 was awarded.

„ 339, The Prize Essay to which £10 was awarded.

„ 359, The Prize Essay to which £10 was awarded.

„ 434, for "Textile" read "Fictile" manufactures, &c.